Consulting Engineer

May, 1958

HERSCHEL H. ALLEN, senior partner of J. E. Greiner Company, in Baltimore, and president of the American Institute of Consulting Engineers, is one of the nation's most prolific bridge designers. It is impossible to travel far by car or train in the Eastern United States without crossing one of the more than two dozen bridges (valued at approximately

Continued on page 11

POWELL

world's largest family of valves

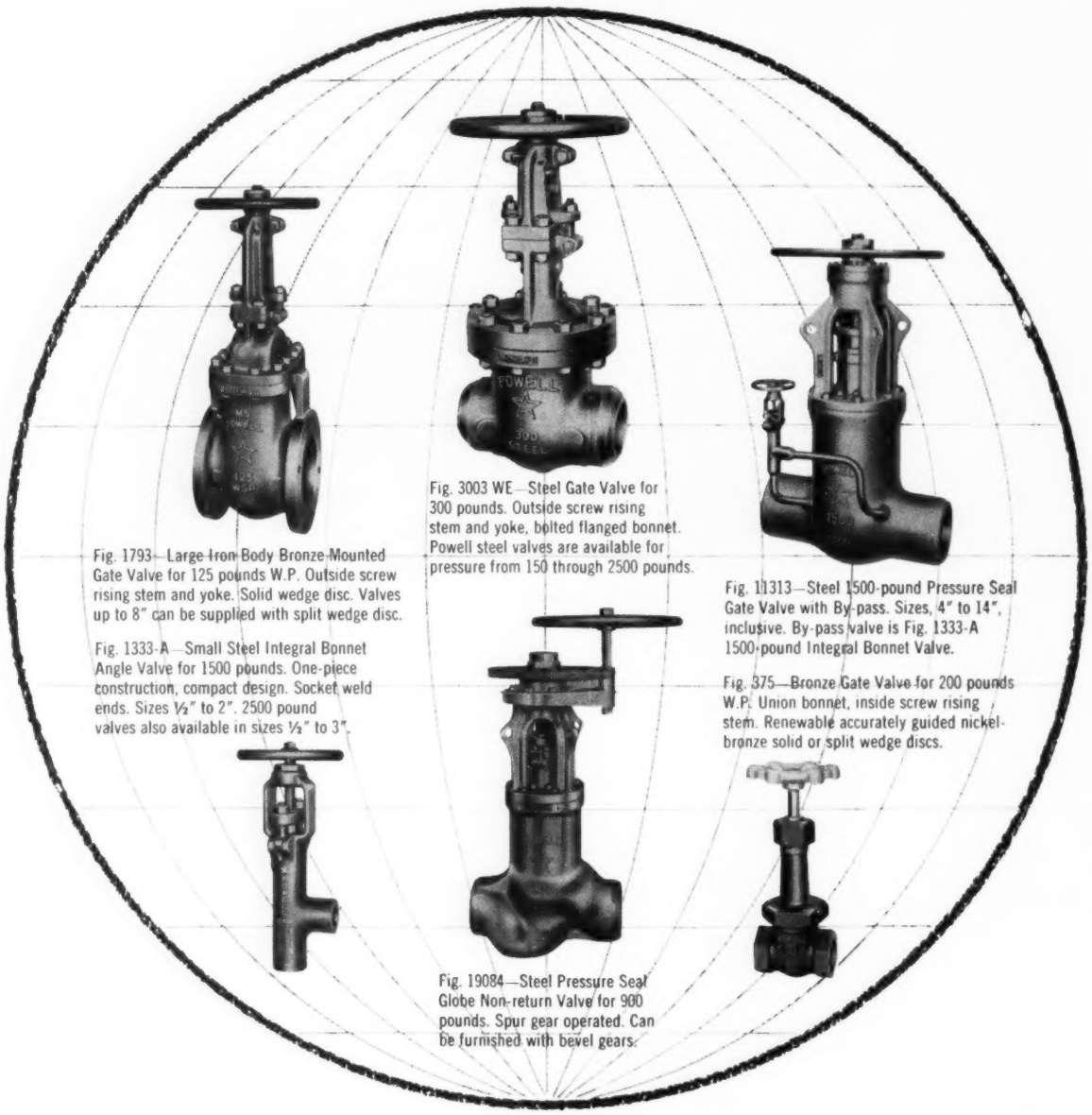


Fig. 1793—Large Iron Body Bronze-Mounted Gate Valve for 125 pounds W.P. Outside screw rising stem and yoke. Solid wedge disc. Valves up to 8" can be supplied with split wedge disc.

Fig. 1333-A—Small Steel Integral Bonnet Angle Valve for 1500 pounds. One-piece construction, compact design. Socket weld ends. Sizes ½" to 2". 2500 pound valves also available in sizes ½" to 3".

Fig. 3003 WE—Steel Gate Valve for 300 pounds. Outside screw rising stem and yoke, bolted flanged bonnet. Powell steel valves are available for pressure from 150 through 2500 pounds.

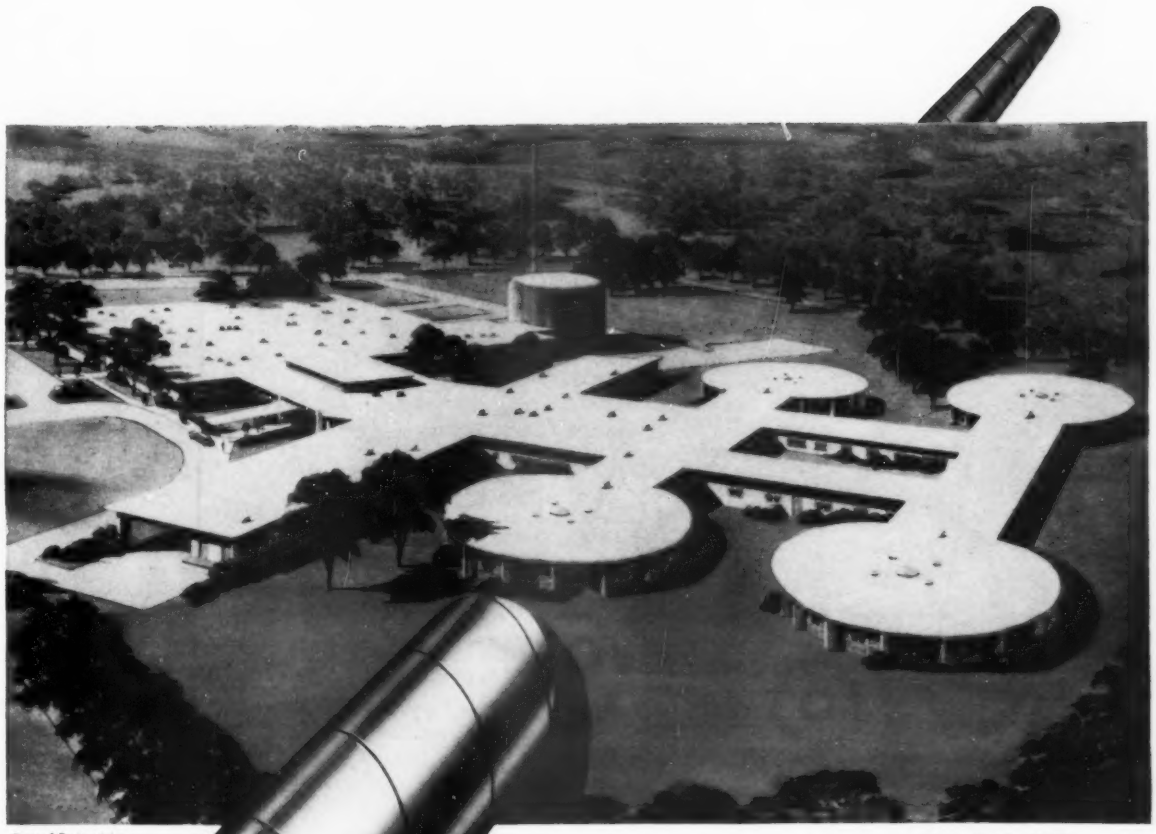
Fig. 11313—Steel 1500-pound Pressure Seal Gate Valve with By-pass. Sizes, 4" to 14", inclusive. By-pass valve is Fig. 1333-A 1500-pound Integral Bonnet Valve.

Fig. 375—Bronze Gate Valve for 200 pounds W.P. Union bonnet, inside screw rising stem. Renewable accurately guided nickel-bronze solid or split wedge discs.

Fig. 19084—Steel Pressure Seal Globe Non-return Valve for 900 pounds. Spur gear operated. Can be furnished with bevel gears.

A solution for every kind of flow control problem is as near as your local Powell distributor. Powell valves are designed and engineered in the largest variety of metals and alloys, to handle any medium, every flow control requirement. There are Powell distributors in all principal cities. Or, if yours is a special engineering problem, write to:

THE WM. POWELL COMPANY • *Dependable Valves Since 1846* • **Cincinnati 22, Ohio**



MEDICAL RESEARCH CENTER
Brookhaven National Laboratory, Upton, N.Y.

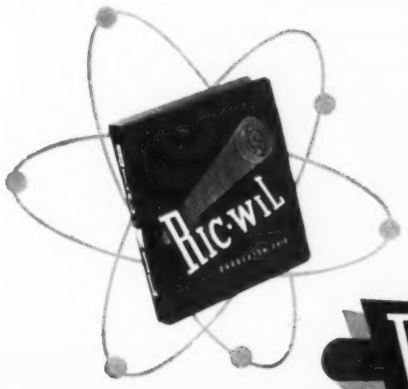
General Contractors:
Malan Construction Corp.
New York, N.Y.
Architects:
Eggers & Higgins
New York, N.Y.
Engineers:
Syska & Hennessy Inc.
New York, N.Y.

Ric-wiL serves the nation's first nuclear reactor designed for medical research and treatment . . .

Malan Construction Corp. of New York City as prime contractor, is building for the Atomic Energy Commission the Nation's first medical research center containing a nuclear reactor designed specifically for medical research and therapy. The entire medical center, including the reactor, is scheduled for completion in 1958 at a cost of approximately $6,000,000.

Ric-wiL prefabricated piping was specified and installed to handle the underground steam distribution. Ric-wiL, Incorporated is proud to be a part of the nation's peace time program in Atomic development.

Write for the illustrated catalog covering the complete line of Ric-wiL systems available.



Quality Piping Systems . . .
. . . of Exceptionally High Thermal Efficiency

SINCE 1910

RIC-WIL INCORPORATED — PREFABRICATED INSULATED PIPING SYSTEMS

BARBERTON, OHIO

IN CANADA: THE RIC-WIL COMPANY OF CANADA LIMITED

NEWS RELEASE

Union Tank Car Company, Chicago, Illinois

For Release: Immediately

Union Tank Car Company, Chicago, announces that Graver Water Conditioning Co. has become a completely integrated and wholly owned division of Union Tank, effective Jan. 1.

E. A. Locke, Jr., President of Union Tank Car Company, stated there will be no basic change in policy or method of operation of its new division, which will be known as Graver Water Conditioning Co., Division of Union Tank Car Company.

"We are devoting special attention to the expansion of Graver's research and development program in the vital and growing water conditioning industry," Locke stated.

H. T. Sulcer will continue as Vice President and General Manager of Graver Water Conditioning Co., a position he has held for the past nine years.

The

May we call this Announcement to your attention...

As a practical matter, these combined assets make available to you the largest resources in our industry committed to an intensive program of chemical research and engineering development. This program will continue, on an expanded scale, to be a fundamental part of the Graver Water Conditioning Co. policy in developing creatively engineered equipment designs and products for the Utility, Industrial Power and Nuclear Industries.

For the past 50 years, our belief in research and development has been instrumental in pioneering the products that assure the ultra-pure feedwater and condensate required for the progressive evolution of higher pressure steam generators.

We believe that continued progress of our industry can only be accomplished through dedicated chemical and engineering research. Extensive laboratory and pilot plant studies are just two of the many phases of activity in our program of continued service to you.

Consulting Engineer®

The Consulting Engineer's Professional Magazine

Wayne near Pleasant Street
Saint Joseph, Michigan

May, 1958 • VOLUME X • NUMBER V

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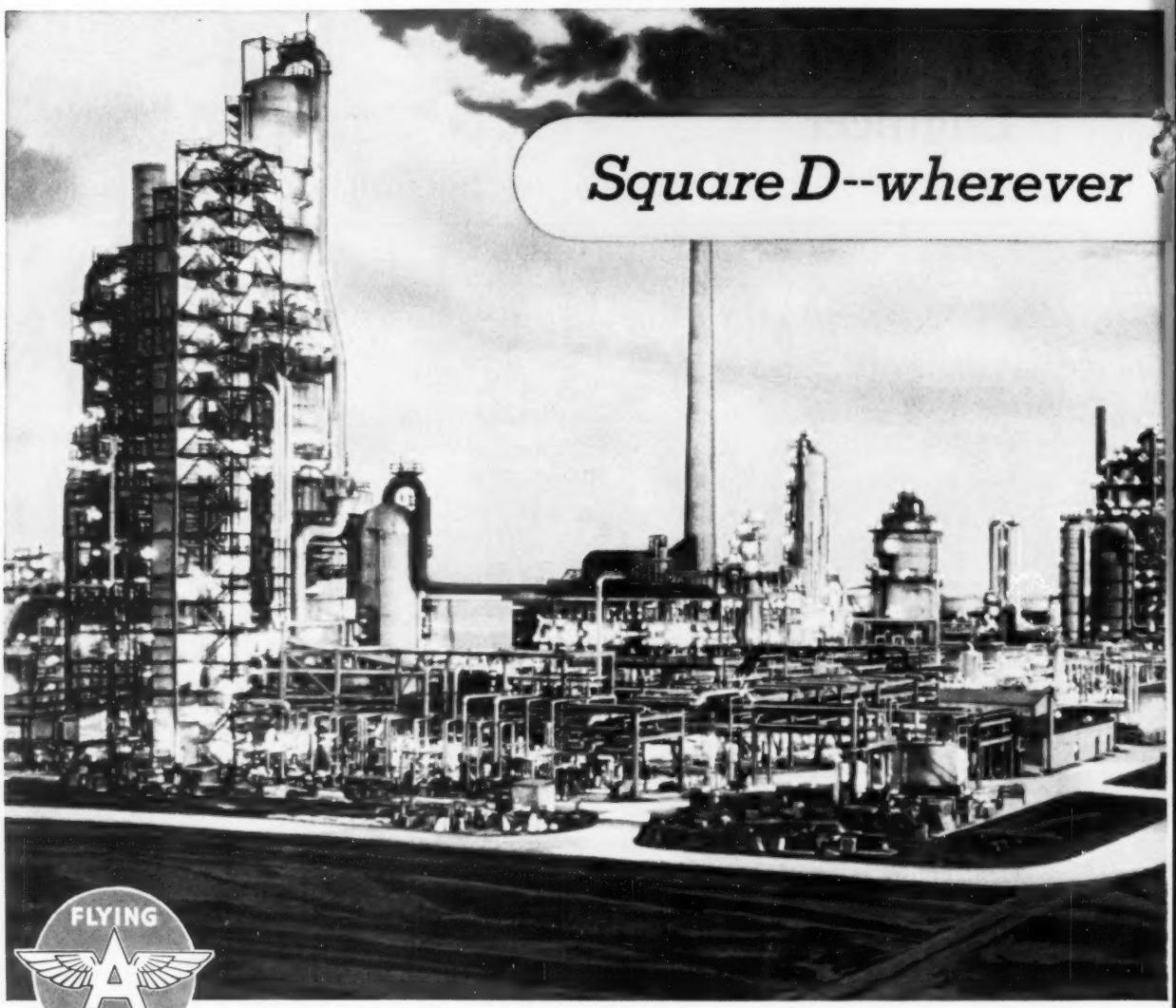
BPA



LARGEST EVER BUILT AT ONE TIME!

Tidewater Oil Company's new Delaware Refinery has been aptly described as representing the most advanced thinking of refinery engineers and technologists.

Located on a seven-square-mile site near Wilmington, this gigantic, 200 million dollar installation has a processing capacity of 130,000 barrels of crude oil daily. It can produce enough over-100 octane gasoline, each day, for 41 million miles of motoring. Six of its eleven processing units are the largest of their types ever built.

Square D electrical distribution and control equipment plays an important part in many key operations of this "refinery of the future."

FIELD ENGINEERING SERVICE is available through more than one hundred Square D offices, backed by an international network of over 1000 authorized electrical distributors and 17 plants in the United States, Canada, Mexico and England.

Executive Offices • 6060 Rivard Street, Detroit 11, Michigan

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

...electricity is distributed and controlled

Square D Control Panel (*above*) is the heart of the CO_2 fire control system in the Testing Laboratory. In case of fire, exhaust fans are stopped and air-conditioning ducts blocked, automatically. Flow of explosive air to other areas is shut off instantly.

(*above*) You'll find **Square D Control Centers** strategically located in many spots. In the refining area they provide a portion of the centralized control of pumps and compressors. In the maintenance shop they control power, heating, ventilating and lighting.

(*at right*) Another **Square D Control Center**, located in the Employe Relations Building, provides pushbutton control of air-conditioning units and compressors. Infirmary X-Ray equipment and parking lot lighting also are remotely controlled from this Center.

A *Complete* LINE OF ELECTRICAL DISTRIBUTION AND CONTROL EQUIPMENT

SAFETY SWITCHES
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METER MOUNTINGS
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VOLTAGE TESTERS
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RELAYS AND CONTACTORS
TIMERS
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LIMIT AND FOOT SWITCHES
PRESSURE, FLOAT, & VACUUM SWITCHES
ADJUSTABLE SPEED DRIVES
CONTROL CENTERS
HIGH VOLTAGE CONTROL
SYNCHRONOUS MOTOR CONTROL
WELDER CONTROL
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LAUNDRY CONTROL
ELECTRIC TRUCK CONTROL
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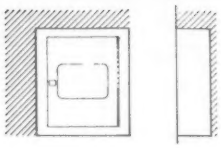
CRANE & HOIST CONTROL
RESISTORS
MAGNETIC BRAKES
LIFTING MAGNETS

"Greatest improvement in Standpipe Fire Protection in 50 years!"

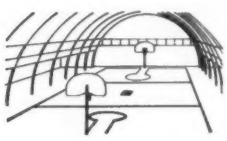
New... ALLENCO

HOZEGARD CABINETS

UL Listed

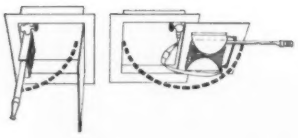


- **Save Space**—35% less area, less depth; not limited to walls, may be installed on any plane, even floors*



- **Cut Cost**—save 25%-30% on each unit installed, by eliminating costly pin-type rack and time of loading hose on it

- **Serve Best**—foulproof door-rack swings full 180 laterally *or* vertically; hose "points" faster, reaches further



UL Listed—thoroughly tested; *first* complete fire hose cabinet unit, including equipment, to be 100% Underwriters Listed

**using appropriate framing and solid (no glass) door*

Fig. 7168
19"x22"x5½" I.D.
Holds 50 or 75-feet
of 1½" linen hose

11.2 FIRE EXTINGUISHERS AND CABINETS:

Contractor shall provide and install the following fire extinguishers and cabinets complete, as manufactured by W. D. Allen Manufacturing Co., (Allenco) or approved equal. Extinguishers shall be filled and ready for use.

A. Fire Extinguisher Cabinets: 8 (eight) required, one at each fire alarm station, installed as detailed, unit #285 12" x 27" x 8" cabinet complete with Allenco aluminum door and trim, glazed with single strength glass, and flush fitted flat key cylinder lock.

Also!

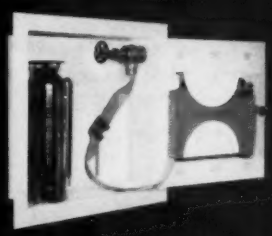


Fig. 7169
26"x27"x8" I.D.

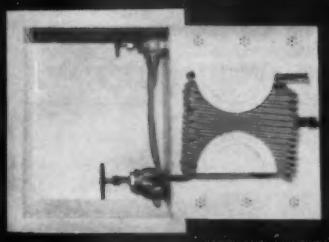


Fig. 7172
24"x30"x8½" I.D.

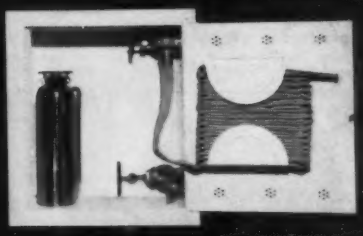
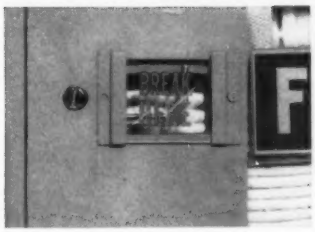


Fig. 7173
27"x30"x8½" I.D.

Each holds up to 100 feet of 1½" linen hose, 50 or 75 feet of Allen-flex hose, or 50 feet of Qua-flex hose, plus choice of extinguishers where shown and Fire Department valve where shown.



Tamper-proof Latch Shield (*optional*) keeps contents safe for emergency, yet breaks clean instantly

Blends Into Any Surface: choice of 3 trims, 2 door styles; finish on the job or by factory to your specs; face-flush vents

For SELF DEMONSTRATION or DATA phone your ALLENCO Fieldman (listed in Yellow Pages) or write . . .

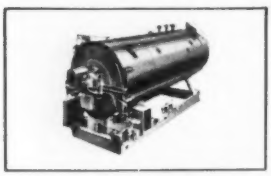
ALLENCO

W. D. ALLEN Manufacturing Co.

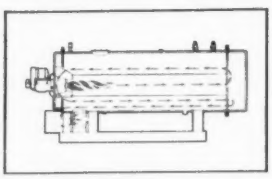
Room 500 Allenco Bldg. 566 W. Lake St. Chicago 6

Tell us where to send your copy of this handy digest reference (not a catalog) for specifying or installing non-sprinkler fire protection.

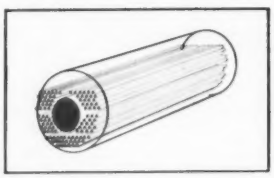
NOW . . . all these "BIG BOILER" features in a compact, economical package . . .



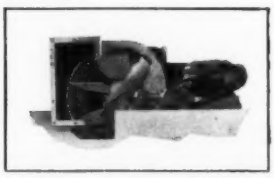
● **A complete package** including boiler burner, draft equipment, controls and all interconnecting piping and wiring. Completely assembled and factory fire-tested.



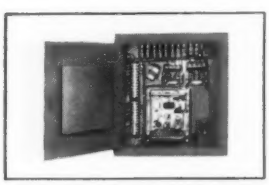
● **4-pass down-draft** design, promotes rapid water circulation. Decreasing tube volume in successive passes provides high combustion gas velocities and maximum heat transfer.



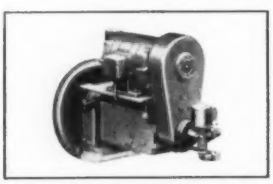
● **5 sq. ft.** of heating surface per b.h.p. Units reach conservative ratings with ease. Guaranteed thermal efficiency 80%. Stack temperatures not exceeding 125° above steam or water.



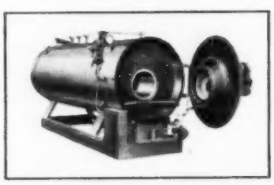
● **Induced draft** operating at relatively slow speed results in unusual quiet plus safety from danger of forcing gases out into boiler room. Negative furnace pressure also protects refractory.



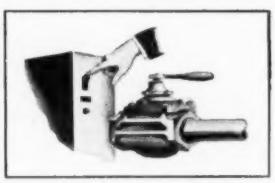
● **Fully automatic** operation firing oil, gas or both. Firing rate adjusts to demand, never overfiring wastefully, but handling sudden increases without lag. Variety of controls available.



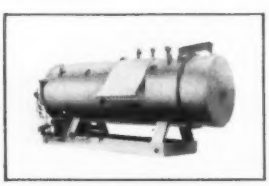
● **Superior Rotary Burners** on all sizes firing No. 4, 5 and 6 oil. Most dependable type of equipment ever devised for burning heavy oils. Burners require minimum supervision, and no lubrication.



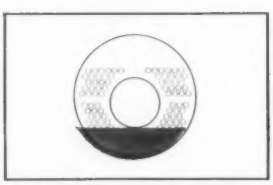
● **Hinged** front and hinged or davited rear door on all units. Doors may be opened simply without removing refractory and are simply and effectively sealed with standard asbestos rope.



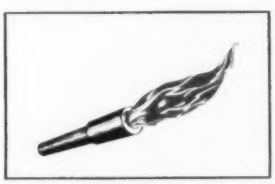
● **Instantaneous fuel change-over.** Units equipped for oil and gas firing may be changed from one fuel to another quickly and simply by operating only a switch and a valve.



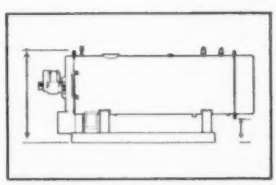
● **Completely insulated** and jacketed. Even the bottom of the boiler shell is covered with 2" insulation. No uninsulated areas for heat loss and unnecessary heating of the boiler room.



● **Down-draft design** places furnace high in shell, safely away from danger zone . . . completely eliminates bagging and blistering resulting from mud build-up in bottom of boiler.



● **Constant gas pilot** remains lit at all times, prevents accumulation of gas in the furnace which could result from even an almost undetectable leak in the gas valve.



● **Low total height** but with clearance from floor allows ample room under the shell for inspection, maintenance and installation of piping. The COMPACT is practical as well as compact.

SUPERIOR "COMPACT"

Here at last is a boiler which combines all of the most desirable features of big boiler design with an unusual degree of compactness. Ideal for installations where space is limited, it also provides an economical answer both from the standpoint of purchase and installation costs for any application having steam requirements of from 20 to 200 B.H.P.

Pressures to 250 psi, or hot water units also available. Write today for Bulletin 1007C.

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

Specialists in **PACKAGED BOILERS . . .** exclusively

Herschel H. Allen

—Starts on front cover

$225 million) that Allen's firm has designed. He also is well known as the consulting engineer for the Pennsylvania, Ohio, and Indiana Turnpikes.

Allen has followed a family tradition, centering his personal and professional life in the Baltimore area where his family has lived for years. After settling in Pennsylvania with William Penn, Allen's ancestors moved to Baltimore County. Allen's father, Newton D. R. Allen, taught school in Baltimore County for a number of years. An engineer, he later served as County Surveyor and as a member of the Maryland Senate.

The oldest of five children, Herschel Allen was born in Gorsuch Mills, a tiny settlement in the low hills of northeastern Baltimore County. While still in high school, Allen took an interest in his father's engineering work, and before he had any formal training, young Allen worked out line and differential levels to determine the elevation between a reservoir and his father's home several miles away.

During his student days at Maryland Agricultural College (later absorbed by the University of Maryland), Allen had his first job as a junior inspector of curbs, gutters, and pavement for the Baltimore County Highway Engineer. Henry G. Shirley (who later was Virginia's Commissioner of Highways and had that State's Shirley Memorial Highway named in his honor) was Baltimore county engineer at that time. He looked upon Allen as his protege.

Joined J. E. Greiner

After graduating with a bachelor of science degree in civil engineering, Allen returned to the Baltimore County Highway Department, where he surveyed and worked on the drafting board in connection with the design of a bridge across Baltimore County's Back River.

"I guess my interest in bridges dates back to this time," Allen recalled. For as he continued his schooling and his engineering, his efforts seemed to center more and more around bridge design.

Attending graduate school part time, Allen was one of the first students to enroll in Johns Hopkins Engineering School. Along with his graduate studies, Allen got a job with the State Roads Commission of Maryland, again working with Shirley, then chairman and chief engineer for the Commission. Here Allen became a bridge designer. While working on the Hanover Street Bridge, one of Maryland's largest public projects up to that time, Allen met J. E. Greiner, consulting engineer.

When World War I was declared, Allen resigned his position with the State Road Commission and joined the Corps of Engineers as a First Lieutenant and later advanced to the rank of Major.

After the War, Allen returned to Baltimore with the J. E. Greiner Company as a designer, and also attended the University of Maryland, receiving his degree in 1922. (In 1940, he received an honorary doctorate degree from that University.)

Founded by John Edwin Greiner, in 1908, the J. E. Greiner Company had specialized in railroad engineering, and the firm grew with the rapid expansion of railroad transportation facilities. This led to an early specialization in the design and development of railroad bridge structures and, other railroad facilities, including waterfront developments. As railroad equipment became heavier, the bridges became overloaded, and the firm took a leading part in railroad programs to strengthen existing structures to carry heavier loads.

During the 1930s, when highways became too expensive for the governments to finance alone, the J. E. Greiner Company pioneered in the coordination of legal, financial, and engineering services, and became acquainted with investment bankers, bond attorneys, and others who specialized in the development of public works programs financed through the sale of revenue bonds. And even now, participation in turnpike, toll road, and toll bridge projects financed in this manner forms a large part of the firm's engineering practice.

One of Allen's first projects with Greiner was the Soldiers and Sailors Memorial Bridge, in Harrisburg. He was working on the Potomac River Bridge when he devised a new pier construction which has been used widely in later years on such structures as the Chesapeake Bay Bridge.

Allen's Chesapeake Bay pier design consisted of heavy steel pilings carried down 200 feet below the water surface and capped about 10 feet below the bottom of the Bay with concrete encased in steel forms shaped like inverted funnels. These were coupled by diaphragms in two-bell and four-bell sections carried above the water surface and filled with concrete. The piers do not require a cofferdam, since the steel molds become a permanent part of the bridge after the concrete is poured.

Valued at $44 million, the 22,990-ft Chesapeake Bay Bridge design was begun in 1938 as a part of the primary bridge program for Maryland's highway system. Construction was delayed by World War II, and a hurricane in 1950 caused further trouble.

Open to traffic in 1952, the bridge eliminates the water barrier between the Eastern and Western Shores of Maryland and provides a route from the new Delaware Memorial Bridge to the South, bypassing congested Baltimore and Washington.

Among the other bridges on Allen's design roster are: five bridges for Johnstown, Pa.; the Rappahan-

nock River Bridge, at Fredericksburg, Va.; cantilever and suspension bridges across the Ohio River, built as privately owned highway toll facilities; more than 12 bridges for the Maryland State Road Commission (including the Susquehanna River and Potomac River Bridges, valued at approximately $5 million each); Mystic River Bridge, Boston; Delaware River Bridges for the Delaware River Joint Toll Bridge Commission; and the Rickenbacker Causeway and Matanzas River Bridge, in Florida. The firm also was engineering manager for the Patapasco Tunnel Project, completed in 1957 at a cost of approximately $130 million.

New Offices Opened

During the past few years, the J. E. Greiner Co. has opened a branch office in Seattle, Wash., and has formed two new corporations: J. E. Greiner Co. & Associates, Inc., in Albany, Ga., and J. E. Greiner Company, Inc., in Tampa, Fla. Allen is chairman of the board of the two corporations. The original Baltimore firm is a partnership, not a corporation.

Just before World War II, Greiner began work on defense contracts. By the end of the war these contracts totaled $240 million. Allen and a number of employees planned Fort George G. Meade, which was completed in less than one year. Then the entire group moved to Jacksonville, N. C., where they worked with George Watts Carr, architect, to transform 125 square miles of Carolina swamps into Camp LeJuene Marine Base. At the same time, Allen and his men were designing Cherry Point Marine Air Base nearby, which was the nation's largest air base at that time.

The Greiner firm also designed Friendship Airfield in Maryland, which was completed in 1945. This air base is to be used as a jet field for the Washington area, until International Airport can be relocated at Chantilly, Va., the location recommended by the Greiner Company.

What of a Recession?

What does Allen think an extended business recession would do to thriving firms like his own?

"It seems to me a recession would necessitate public works extension programs for municipalities and other governmental organizations. Consequently, a recession likely would provide additional work for consulting engineers."

Allen said the Federal Highway Program also will keep a recession away from the doors of a large number of consulting firms. As a result of the Federal road program, Allen's firm presently has design contracts with Ohio, West Virginia, Georgia, Delaware, Florida, and Maryland. In addition the firm is handling special work for the Bureau of

IT PAYS TO HAVE GOOD CONNECTIONS
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and here's another
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A. C. presSwitch

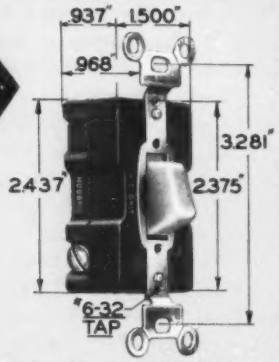
A press, it's on... a press, it's off!

Smooth, press action and attractive appearance combine with rugged inner construction to make this new "Presswitch" the ultimate in convenience, utility and dependability. Designed for all A.C. applications, it is particularly well suited to large 277 volt fluorescent lighting installations.

DIMENSIONS

Cat. No. 1251-I
15 amps., 120-277 volts
Single pole A.C. "Presswitch" with thru-connection and ivorine nylon button.

Fits standard wall boxes; accommodates standard wall plates.



Now available at your Hubbell electrical distributor in single pole, double pole, three-way and four-way with either brown or ivorine nylon button.

APPLICATIONS

Attractive styling blends with conventional or ultra modern interiors. Presswitch looks "at home" in a factory or in a residence. It is ideal for infirmaries, conference rooms, rest rooms, laboratories, offices, etc., where the modern press action simplifies light control. It is suitable for all A.C. applications, particularly the 277 volt, instant start, slimline, single pin base fluorescent systems. It may be used at full rated capacity for incandescent and fluorescent lighting as well as for resistance loads. Also practical for motor loads (120-277 volts) at 80% of current rating of switch.

ADVANTAGES

Modern Press Action...
Turns on or off with a light touch of the hand, press of the finger or nudge of the elbow; provides smoother, easier operation.

Rugged Inner Construction...
Sturdily designed with rugged inner cam mechanism assuring smooth, dependable and quiet operation; long trouble-free life.

Thru-connection Simplifies Wiring...
Wires normally spliced are securely joined by inserting them straight in under the thru-connection terminal screw. Each terminal accepts two conductors (sizes from #14 to #10). Available in single pole units only.

Functional Design...
"Presswitch" blends with conventional or modern interiors; lends itself to large production areas or to home surroundings.

Requires No Special Wiring...
Fits standard wall boxes and utilizes standard wall plates. Operates in any position.

Listed by Underwriters' Laboratories

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INSTALLATION EASIER: Line assembled at the factory —eliminates expensive field labor.

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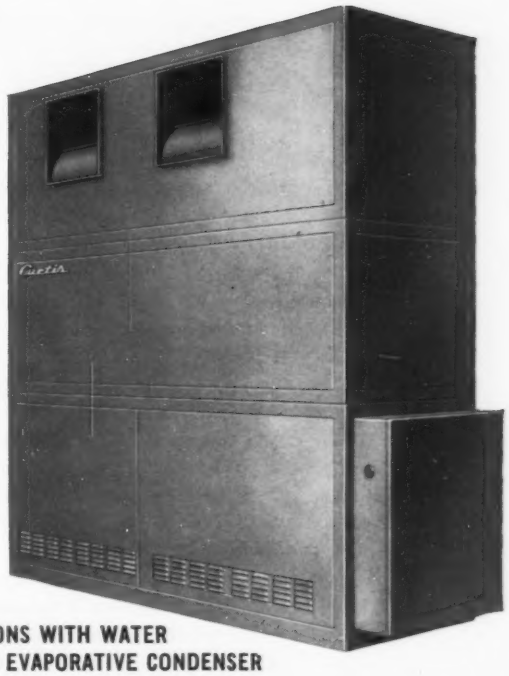
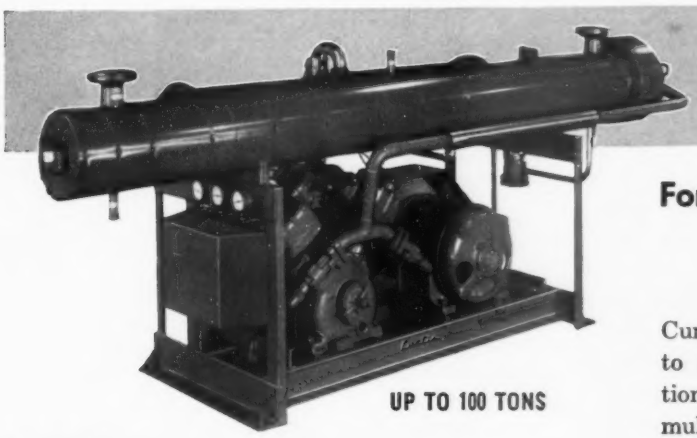
SUPERIOR EQUIPMENT: Long life, quiet, trouble free, economical operation.

DELIVERY ON TIME: Curtis can meet your delivery requirements, a decided advantage over multiple supplier delivery promises!



UP TO 50 TONS WITH WATER COOLED OR EVAPORATIVE CONDENSER



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PACKAGED LIQUID CHILLERS

For Air Conditioning Process Cooling Refrigeration

Curtis packaged liquid chiller lends itself to a widely diversified field of applications—air conditioning, refrigeration and a multitude of process cooling procedures. Available in capacities up to 100 tons.

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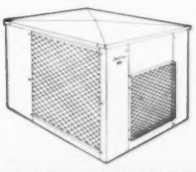
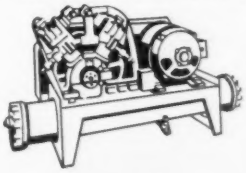
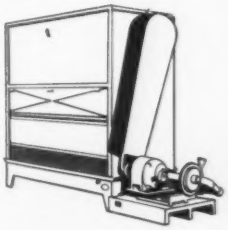
For your complimentary copy of the *Curtis* Engineering Manual, write on your letterhead to: Chief Engineer, Curtis Mfg. Co., 1991 Kienlen Avenue, St. Louis 20, Mo.



Air Cooled Air Conditioning Units, 3-5-7½ tons. Residential and commercial application.



Condensing Units up to 100 tons.



Cooling towers and evaporating condensers, air handling units to match.

C-33

Public Roads in the preparation of contract plans and specifications.

In his busy business life, Allen has not neglected the professional organizations he considers so important to the engineer. His interest dates back to the 1930s when he obtained registration in New York State before Maryland even had a registration law. Since then, he has been registered in 29 other states, and is a member of NSPE.

Besides being current president of the American Institute of Consulting Engineers, Allen is a life member of the American Society of Civil Engineers; past president of the Maryland section of ASCE; a former board member of the American Road Builders Association, engineering division; and past president of the Engineers Club of Baltimore. He also is a member of the American Institute of Steel Construction, Association of Highway Officials of the North Atlantic States, Engineers Club of N.Y., and Society of American Military Engineers.

Under Allen's leadership, the 48-year-old American Institute of Consulting Engineers is upping its membership. Two years ago the Institute had 200 members. Today the membership is 260, and Allen predicts the Institute will continue to grow "with the growing profession."

In discussing his work with the Institute, Allen recalled that J. E. Greiner, the founder of Allen's firm, was a charter Institute member and also was a member of the original Institute Council.

One of Allen's primary ambitions for the Institute is closer liaison with the Engineers Joint Council. Current EJC president Enoch Needles, of Howard, Needles, Tammen & Bergendoff, has instituted a move to tie in the activities of the EJC more closely with those of its constituent societies.

For a number of years, the Institute has offered advice and assistance to the founder societies, often endorsing programs pertaining to the consulting engineer. "We always have stressed the importance of active participation in the founder societies," Allen pointed out. "One primary requirement for Institute membership is that the engineer must hold membership in at least one of the founder societies."

Institute Looks Ahead

What else is the Institute doing these days?

The legislative committee again has taken a stand in New York State's recurring battle over corporate practice. The Institute contends that corporate practice should be allowed, provided all officers and stockholders in the corporation are licensed professional engineers.

The Institute also has cooperated, at the suggestion of White House advisors, in a study of the governmental economy recommendations of the Hoover commission. A number of the Institute's suggestions have passed both the Senate and House.

Currently, the Institute also has a committee to cooperate with the government missile program. "The invention of the airplane led to many engineers designing airports, and I think the development of missiles will present equally interesting structural problems," Allen commented. "If our Institute plans materialize, we will have government missile experts appear at some of our luncheon programs to explain recent missile developments and suggest ways in which we can be of assistance."

Despite the many hours Allen spends at his engineering and professional organization activities, he has another interest "which helps keep my feet on the ground."

Since his boyhood on the farm, Allen has retained an interest in cattle, particularly shorthorn cattle. For many years he has owned the Hi-Ho Farms, where he has a herd of 250 purebred shorthorns. This farm is described by a Baltimore newspaper as one of the top shorthorn-breeding farms in the East. Allen is a member of the board and a past president of the American Shorthorn Breeders Association.

Allen's sons share his many interests. Herschel H. Allen, Jr. manages Hi-Ho Farms; Charles Burke Allen is a partner in the J.E. Greiner Company, and John Allen is studying engineering at Loyola College. Allen also has two daughters and 15 grandchildren. ▲▲

Movement due to winds and temperature extremes pose a trying problem for designers of curtain wall buildings. The joint material must seal out water, dust and air but must remain flexible and resilient under these conditions. Hornflex, a thiokol formulation, provides a squeeze-stretch range of 325% and stays firm and elastic over a temperature range from *50°F BELOW ZERO to 250°F.*

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☐ Please send me free the Horn "Check-up" Chart to help locate damaged structural areas in our building.
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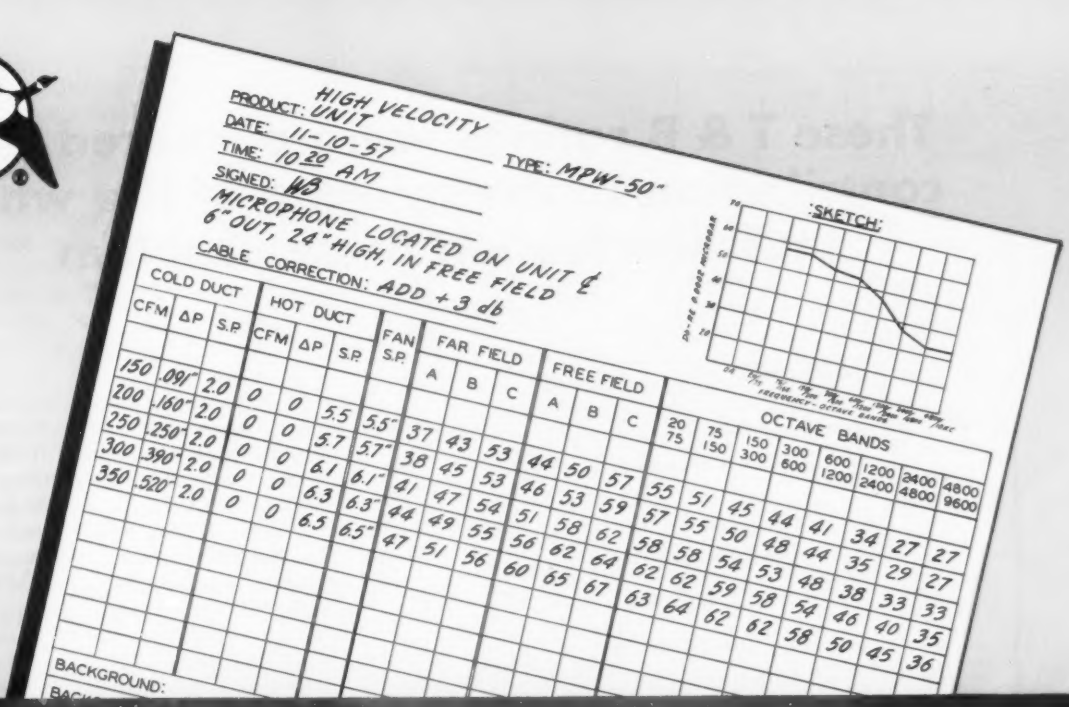

HIGH VELOCITY
PRODUCT: UNIT
DATE: 11-10-57
TIME: 10.20 AM
SIGNED: WB
TYPE: MPW-50"
MICROPHONE LOCATED ON UNIT @ 6" OUT, 24" HIGH, IN FREE FIELD
CABLE CORRECTION: ADD +3 db

SKETCH:

COLD DUCT CFM	ΔP	S.P.	HOT DUCT CFM	ΔP	S.P.	FAN S.P.	FAR FIELD A	B	C	FREE FIELD A	B	C	OCTAVE BANDS 20 75	75 150	150 300	300 600	600 1200	1200 2400	2400 4800	4800 9600
150	.09"	2.0	0	0	5.5	5.5"	37	43	53	44	50	57	55	51	45	44	41	34	27	27
200	.160"	2.0	0	0	5.7	5.7"	38	45	53	46	53	59	57	55	50	48	44	35	29	27
250	.250"	2.0	0	0	6.1	6.1"	41	47	54	51	58	62	58	58	54	53	48	38	33	33
300	.390"	2.0	0	0	6.3	6.3"	44	49	55	56	62	64	62	62	59	58	54	46	40	35
350	.520"	2.0	0	0	6.5	6.5"	47	51	56	60	65	67	63	64	62	62	58	50	45	36

BACKGROUND:

Now available from TUTTLE & BAILEY...

the first sound power ratings based on octave band analysis for air distribution devices

Sound power levels by octave bands have been scientifically established by Tuttle & Bailey for their air distribution devices. These ratings, the first in the history of this segment of the industry, were worked out by Tuttle & Bailey engineers in their own sound laboratories. They conform to the theory of sound evaluation published in the 1957 ASHAE Guide.

These T & B ratings were prepared as a contribution to the solution of the whole air distribution noise problem

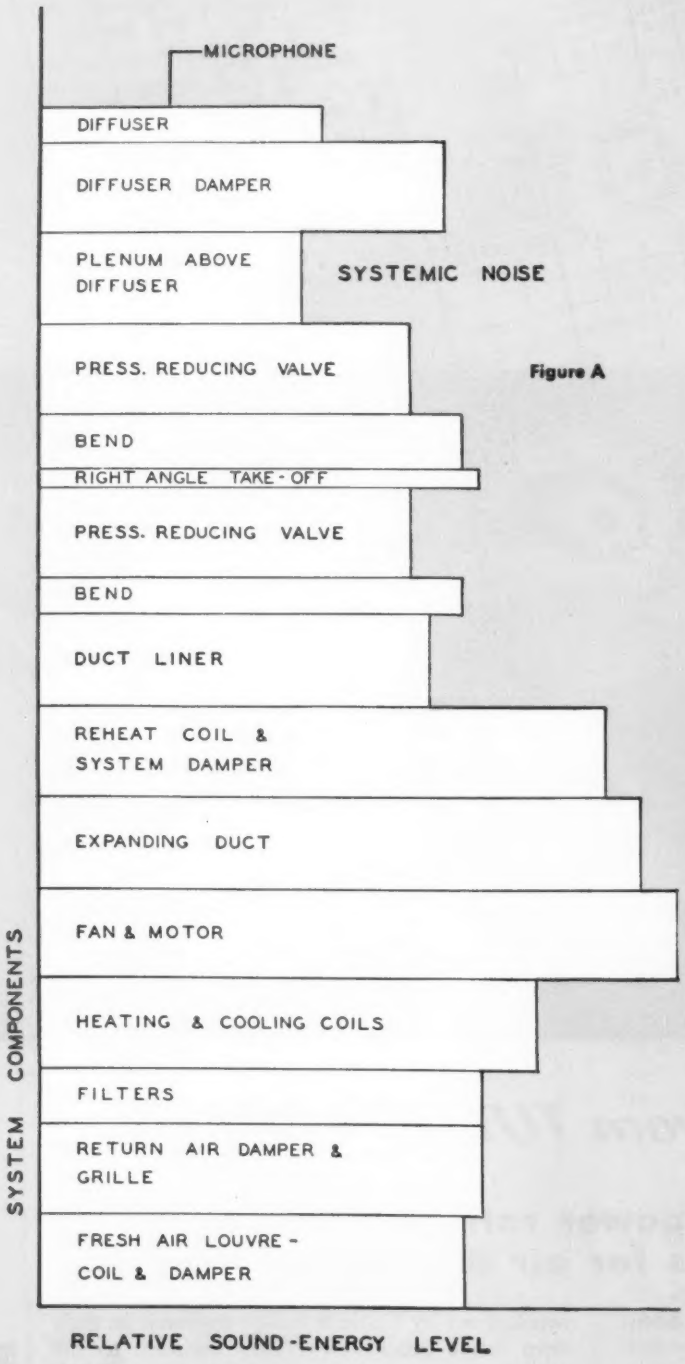

Figure A

A widespread notion has long existed that noise entering an occupied room from an air distribution system is the fault of the outlet manufacturer. Nothing could be further from the truth. The real problem is total systemic noise—the one audible sound which is produced when all of the noises generated in the system by its various components are added together.

Generally the major source of noise in an air distribution system is in the fan room. In this area, outside noises can enter the system through fresh-air intake louvers; and such equipment as refrigeration compressors, condensate pumps, return and exhaust fans, fan motors and most importantly the supply fan itself can add noise to the air being discharged into the duct system.

Other factors that influence the noise control problem are: heating or cooling coils, duct transformations, duct liners, duct work construction, bends, dampers, take-off connections, and the acoustical qualities of the occupied room in terms of room volume and surface absorption.

The noise problem in low- or high-pressure systems differs only in magnitude. Effects on the noise level output produced by each component, with changes in static pressure and air velocity, will vary in magnitude for every air distribution system, but the basic problem will always remain the same.

The total noise generated by all components can be reduced by the use of Tuttle & Bailey sound attenuation units located at the point of air distribution terminals in a high-pressure system.

What happens to sound energy as it leaves the fan and travels by air paths along a duct system is illustrated in Fig. A. The height of the bar represents fre-

quency distribution and the length of the bar represents intensity. The lengths of the blocks indicate the relative growth or decay of sound energy levels as the sound field passes each component in the system. The columns, therefore, increase or decrease in height depending upon whether all frequency components or equivalent broad-band energy are present or whether only certain predominant frequencies are registered.

The relative sound power and sound pressure levels will vary with frequency, and different components will either add or subtract noise from the system in certain frequencies (Fig. B). Frequency in cycles per second is plotted horizontally with a scale of decibels plotted vertically. Each curve delineates the sound-energy distribution as a function of frequency for each major component. In the overall noise produced by an air distribution system there are certain sound frequencies which interfere with speech communication. High noise intensity in the speech interference range (600-4800 cycles per second) can produce occupant discomfort. The final system design curve should be less in the speech interference range than the curve showing the selected room criterion.

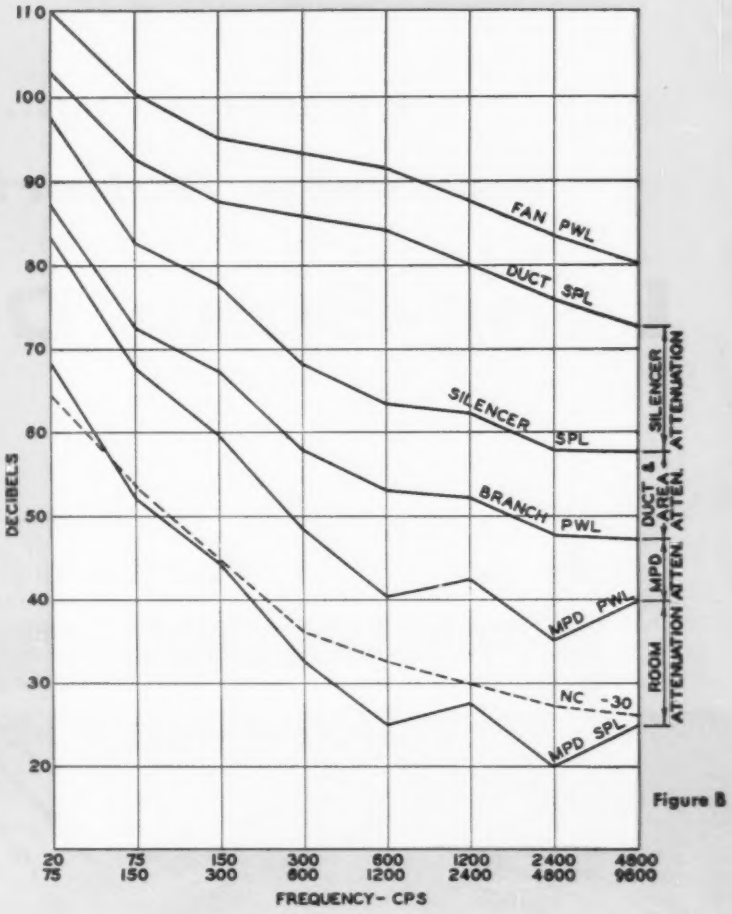

Figure B

For further information on the sound level ratings of Tuttle & Bailey equipment or for help in solving a specific air distribution problem, address: Engineering Department, Tuttle & Bailey, New Britain, Connecticut.

TUTTLE & BAILEY

division of Allied Thermal Corp. New Britain, Connecticut

On the West Coast: TUTTLE & BAILEY PACIFIC, INC., City of Industry, California

A complete line of air distribution equipment and accessories for low- and high-pressure systems.

announcing...

Two new Robertson

Long-Span Deck Types.

H. H. Robertson Company
2431 Farmers Bank Building • Pittsburgh 22, Pennsylvania

Please send additional information on Long-Span Q-Deck.

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COMPANY _____

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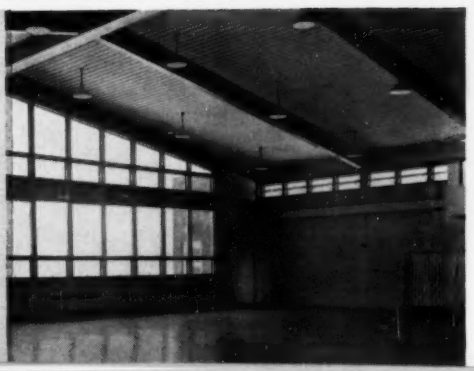
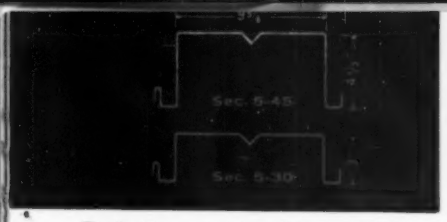
Because Long-Span Q-Deck is manufactured with exceptional accuracy, rib lines are clean and straight—make ideal exposed ceilings. And because the fluted shape has demonstrated a marked degree of noise reduction, further acoustical treatment is not necessary in many cases.





The basic cross-section of Section 5-45 and 5-30 is the same as standard long-span Section 5-75. Only the vertical dimensions are different.

. . .for new roof design freedom

Robertson's Section 5 Long-Span Q-Deck has enjoyed wide acceptance since its introduction two years ago. It has filled the requirements for economical long spans in the construction of schools, supermarkets and other building types. Now, two new variations have been added to further increase cost-savings and add to design latitude.

You will notice from the drawings above that the basic cross-section is the same—only the vertical dimensions have been changed. The underside of the decks retain the same appearance making practical the combination of all three types for greater economy for varying load and span requirements.

As with all of Robertson's five Q-Deck types, the new Long-Span designs are weight-saving, strong, precisely made and easily erected. Lighting fixtures can be recessed, surface mounted or suspended. Any type of insulation (1" minimum) and built-up roofing can be applied. Write for literature which includes complete details, load and property tables.

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Q-DECK

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Reader's Comment

And now, Listen to Murrow . . .

Sir:

We have been receiving CONSULTING ENGINEER for some time and have been impressed with the consistent improvement in this magazine. The articles are well prepared and such features as the "Krick Weather Outlook" in the April issue are an interesting departure from the usual information carried by technical and professional journals.

We take this opportunity to compliment you upon developing a publication that is of real value to those of us in the consulting engineering profession.

Lacey V. Murrow, Pres.
Transportation Consultants, Inc.
Washington, D. C.

ME-EE Too

Sir:

In connection with the appearance of my article on "Perspective Data on Paving Design," in the March 1958 issue of CONSULTING ENGINEER, it has been noted that under the "personal note" you state "his firm specializing in structural, industrial, and general civil engineering."

Inasmuch as our firm also specializes in mechanical and electrical engineering, perhaps you could find it possible in your next issue to make mention of this.

Elwyn E. Seelye
Seelye Stevenson Value & Knecht
New York, N. Y.

Peering at Piers

Sir:

I read E. Czerniak's article, "Design Criteria for Embedment of Piers," (CONSULTING ENGINEER, March) with much interest.

I have used this system for a number of years, and I am glad to see something in print. I would appreciate it very much if I could secure a copy for future reference.

John D. Gibson, Manager
Drafting Department
The Lummus Co.
Houston, Texas

A Real Service

Sir:

It is, of course, practically needless for us to state that we have read and enjoyed your magazine over the last 16 or 18 months and feel that you are doing a real service to our profession, in that you are sort of giving us something that consulting engineers as consultants can use, rather than attempting to aim at the broad group of engineers as a whole.

Keep up the good work.

Robert P. Jaffer
Beeman, Britt, Curley & Jaffer
Tampa, Fla.

Competitor's Computers?

Sir:

I read with a great deal of interest the article "Setting up a Computing Center," which appeared in the April 1958 issue, since I operate a

newly established electronic computing center here in Orange County. We are set up to do data processing for both engineering firms and accountants since both fields of work are characterized by tedious repetitive computations. I have a degree in both engineering and business administration, so I have no trouble in understanding the problems of each field and writing programs for them.

From reading the article it would seem to me that Michael Baker, Jr., Inc. has missed a very good source of business for his center right within his own business. Although the author mentioned that the center would break even at 20 percent capacity, he did not mention that the accounting section of the firm would use the computer. They should look into having the other departments – particularly the administrative departments and estimating departments – make use of the computing center. I think that they will find that company-wide use of the computer will reduce the time required to amortize their programs markedly.

In contrast to the well-thought-out presentation of the article is the remark in the "Reader's Guide" section to the effect that the way to afford a computer is to rent it out. Engineers will find that their competitors will not utilize such an arrangement any more than they will pay his overhead on his present office. The only realistic approach to the problem of renting a computer is to determine the solution on the basis of the work within the firm's own office. If they have enough to justify the monthly rental they should rent. If they do not, they should utilize computing centers such as ours where they will get the advantage of electronic data processing without the fixed high overhead.

Clarence L. Hall
Manager
Electronic Computing &
Data Processing Center
Anaheim, Calif.

Why Not Two Copies?

Sir:

Just a short note to tell you that I enjoy reading your magazine. In fact, I find many of your articles so interesting that I have pulled tear sheets for my files.

In this connection, may I offer a suggestion: please insert one page of advertising between each article. In many instances where one article follows another I reach a moment of psychological indecision as to which part should go into which file. It would appear that your advertisers would welcome this rearrangement.

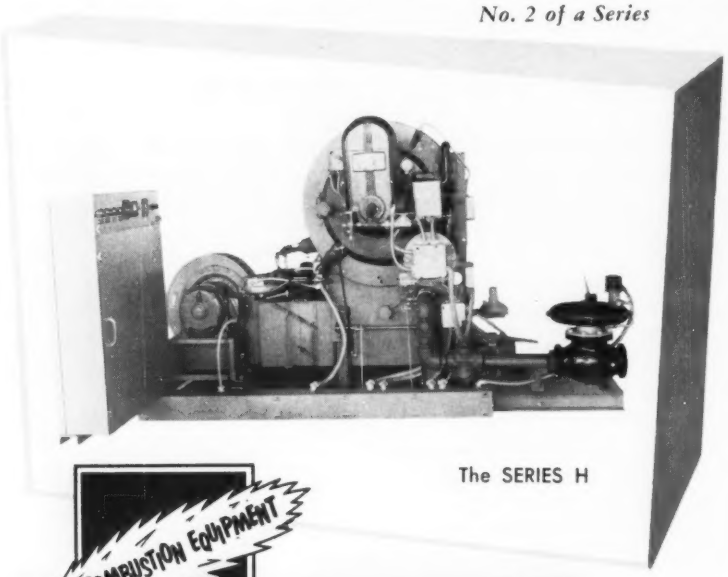
Stephen M. Olko
Consulting Engineer
New York, N. Y.

Aspersions on Asphalt?

Sir:

In the article on "Perspective Data on Paving Design" (CONSULTING ENGINEER, March 1958), Elwyn E. Seelye writes: "Unfortunately, most engineers hesitate to deal in per-

No. 2 of a Series



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ENGINEERED By THE WEBSTER ENGINEERING COMPANY

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Gas, Oil or Combination Packaged Forced Draft Burner for either conventional or pressure firing of scotch marine boilers. Special assemblies and larger sizes available for water tube boilers. Flame retention gas ring insures stable operation over full range.

13 standard sizes from 60 to 500 horsepower.

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Guth brascolite gives you Προ-πρᾶξις* in EVERY incandescent fixture!

EVERY
Brascolite Fixture has a
BRIGHTNESS CHART
COEFFICIENTS OF UTILIZATION
LIGHT CURVE
for better lighting specifications

When you figure an incandescent lighting installation, you naturally want assurance that you'll get the on-the-job performance you need.

Guth gives you this assurance with PRE-FORMANCE, *predetermined* performance that means each Brascolite incandescent fixture will do the job it's supposed to.

Every Brascolite fixture, including the handsome square recessed unit shown above, has a brightness chart, coefficients of utilization and light curve, and other engineering information to help you.

And every Brascolite fixture is a carefully engineered unit, with all parts working harmoniously to produce the finest and most efficient lighting possible.

* **PRE-FORMANCE:**
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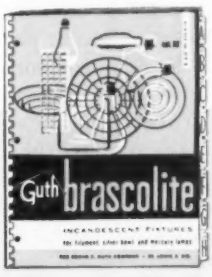

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spective data when it has to do with engineering design." Two letters should have been deleted from one word in this sentence as Mr. Seelye's article amply demonstrates. The prefix "un" should not be on the word "unfortunately."

"Perspective" data, as presented by Mr. Seelye, could also be called "generalized" data, and broad generalizations all too often lead into serious error. For example, perspective or generalized data are presented on the cost per square yard of flexible and rigid pavements for certain wheel loads and soil conditions. An examination of actual bid prices will indicate rather wide variations in unit costs of both types of pavement, as well as variations in relative costs of the two types.

The wide variations in unit cost are readily understandable. Because of differences in labor costs, availability of materials and such, a Southwestern contractor might bid $4 per ton, or less, for hot-mix asphaltic paving and his counterpart in the Northeast might bid $10 per ton, or more. The costs of other construction materials will also vary, depending upon whether the contractor can obtain base materials from a local roadside pit or must import suitable aggregates from a distance.

Also, construction labor costs about twice as much in some sections of the country as in others. And, finally, climatic conditions cause substantial variations in flexible pavement design thicknesses throughout the country.

Unquestionably, there are similarly wide variations in the cost of rigid pavements throughout the country, but the relative costs of the flexible and rigid types also vary over a wide range. Thus, it is fortunate that most engineers hesitate to use such perspective cost data, especially over wide areas of the country.

Much could be written on the subject of "life expectancy" and statistics could be selected to "prove" almost any contention. Perhaps this subject is best summarized, however, by the late Thomas H. MacDonald, testifying as Commissioner of Public Roads before the House Public Works Committee. He stated: "We expect what we call the high-type pavements of any type, blacktop included, to last 25 to 30 years." Thus, one of the most widely experienced and respected highway engineers of modern times attributes an equal life expectancy to the two types of pavement.

Mr. Seelye goes on to point out that the salvage value of rigid type pavements is "high" while the salvage value of flexible pavements is "low." Such a contention will raise many an eyebrow in the paving profession because, in fact, the reverse is true. Let us consider two roads, one of flexible pavement and the other of rigid. Let us assume that both are slightly underdesigned and begin

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to show signs of distress after some period of time. Both may be restored to excellent condition, and their load-bearing capacity increased to adequate standards, by the normal procedure of using an asphaltic overlay. For a rigid pavement, it is common practice to use at least three inches of asphaltic overlay for such a resurfacing, one of the principal reasons being to minimize crack reflection resulting from the continual expansion and contraction of the rigid slabs. Unless care is taken to underseal any cavities beneath these slabs and seal the joints, water will seep into the interface between the rigid slab and asphaltic overlay, providing a potential source of danger to the durability of the overlay. Also, there is usually some degree of permeability in the rigid slab which, in time, will permit water to enter this interface, likewise providing a potential source of trouble.

In overlaying a flexible pavement, however, lesser thicknesses are normally used. The water intrusion and the expansion-contraction problems mentioned above are not present. Flexible pavement rehabilitation, therefore, is normally less costly and, at the same time, more durable. Thus, it seems logical to state that flexible pavements have a higher salvage value than rigid pavements.

With regard to difficulties in the repairs to flexible pavements, cited in Mr. Seelye's article, there is no reason why such repairs should be any more difficult than in rigid pavements. On the contrary, one of the many reasons why asphaltic pavements are almost universally used in city street construction is their ease of repair after making utility cuts. All patching work requires care, skilled personnel, proper materials, and adequate compaction of the backfill. When the backfill is simply thrown into the hole helter-skelter and a cold patching mix spread over the surface, one should not expect any degree of permanence. There is ample evidence in many large cities, however, that skilled crews are capable of patching flexible pavements such that, within a year or so, it is difficult to discern the patch.

Thus, there are inherent dangers in the use of "perspective" or "generalized" data as one may be led into erroneous conclusions which cannot be supported by an engineering investigation of the facts in the case under consideration. All too often, perspectives on the behavior of flexible pavements result from observations on minimum-cost, secondary roads where only a thin skin of asphalt and a substandard base may be responsible for distress. Such construction serves a useful purpose where funds are unavailable to construct a more suitable pavement. Such pavements, however, should not be classed with the modern flexible pavement adequately designed by proven engineering standards. I have often contended that the ver-

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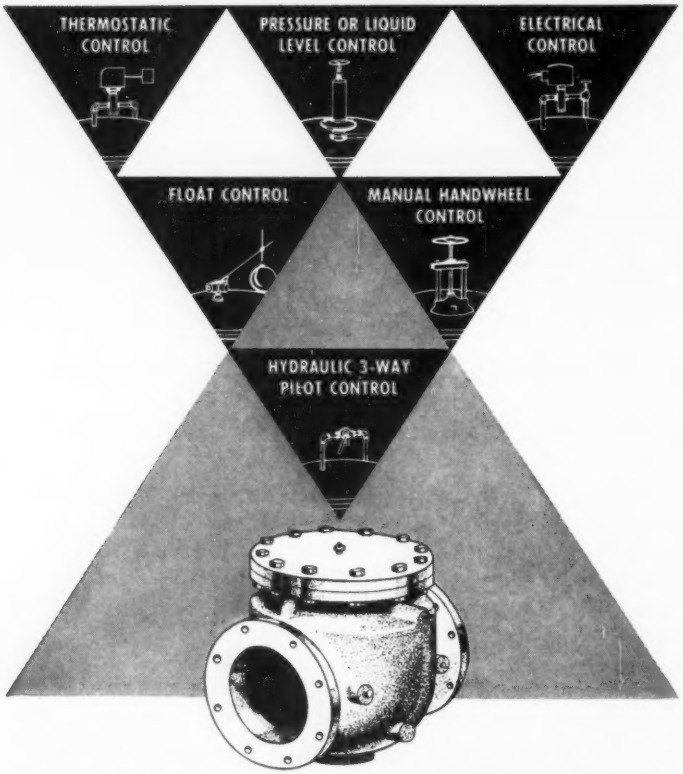

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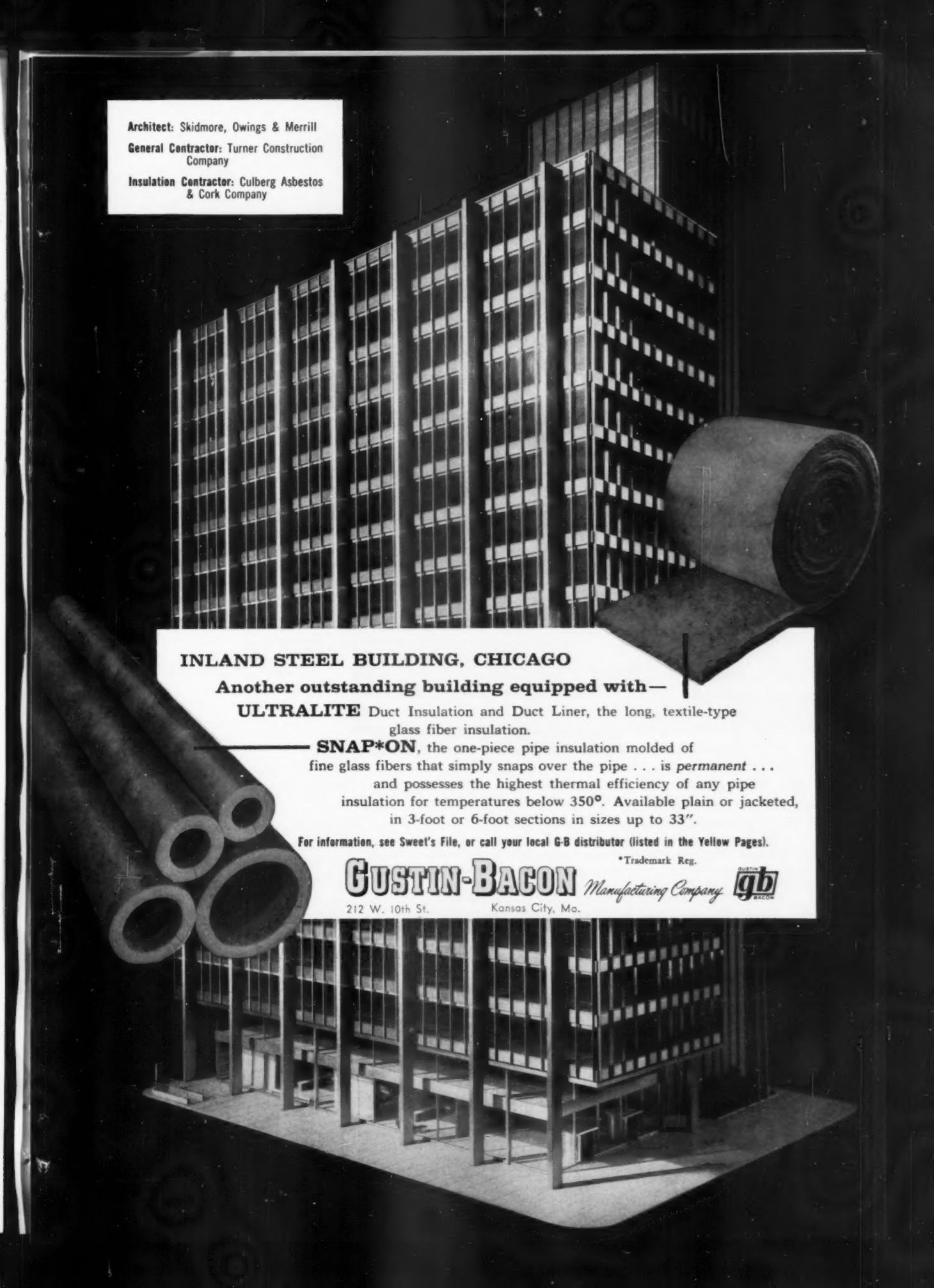
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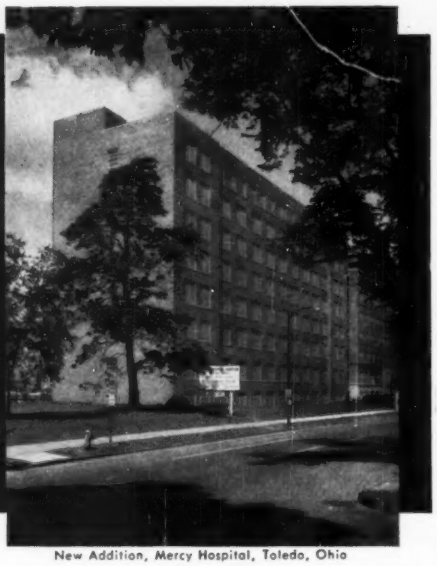
satility of asphaltic materials is its own worst public relations enemy. Such materials are used in all types of pavement from the most economical to the highest type of road construction. All too often, however, the observer is aware only that the surface is black and little or no thought is given to the depth and quality of the pavement structure. Perspectives achieved without proper consideration of such factors may do more harm than good. They are in direct opposition to the objective and analytical appraisals upon which the engineering profession has built an enviable reputation.

John M. Griffith, Research Engineer
The Asphalt Institute
College Park, Md.

(Editor's note: Mr. Griffith sent Mr. Seelye a copy of this letter. Here is Mr. Seelye's answering letter.)

A SPENCER CENTRAL VACUUM SYSTEM



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Consulting Engineer: Harry H. Bond

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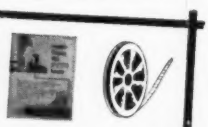

Bulletin #157 describes Spencer vacuum cleaning systems for hospitals. Color Movie illustrates use of systems.

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Mr. John M. Griffith
Engineer of Research
The Asphalt Institute

Dear Mr. Griffith:

It was very courteous of you to send me the copy of the comments you are sending to CONSULTING ENGINEER concerning my article entitled "Perspective Data on Paving Design." The only fault I can find with your article is that you do not roast me enough.

I think the readers of CONSULTING ENGINEER, after reading the original article of mine and then reading your discussion, should be greatly interested in the conclusions.

As to the idea of giving perspective data on a subject with as many variable opinions, and as fluid as is paving design, we sometimes find it advantageous to set up affirmative opinions to be shot at, or, as we say, knocked down. Now, you have done exactly that.

I think the average readers of CONSULTING ENGINEER who are not now paving experts will have learned something, just as I have in writing the original article, and in reading your careful analysis.

I hope I hear some adverse comments from P.C.A.

Elwyn E. Seelye
Seelye Stevenson Value & Knecht
New York, N. Y.

Temperature Tempest

Sir:

You know, of the various magazines I receive CONSULTING ENGINEER is the one that gets perused first; it is always interesting. This time, I would like to offer some remarks, firstly in connection with Lovell on Fahrenheit.

The name of the burgomaster of Magdeburg was Otto von Guericke, not de Guericke. The explanation of how the lower end point of the Fahrenheit thermometer scale was arrived at sounds fantastic. I was told that it represented simply the temperature in the City of Danzig on the coldest day then on record.

The sentence ". . . none of the three modern scales is used in the native land of its originator" is in-

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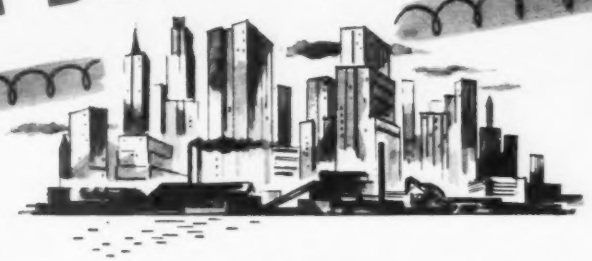

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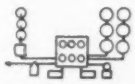

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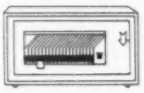

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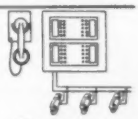

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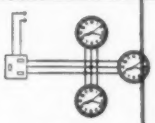

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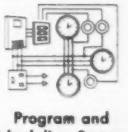

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correct. To begin with, there are no three "modern" scales, but only one. As for the use of Reaumur, a little investigation would have revealed that a century ago, when people were less provincial and more cosmopolitan than they are nowadays, a good many German brewers and distillers went to French schools to study. Also, at that time the French instrument industry flourished and supplied its wares all over Europe. That, and the circumstance that in those days everything that was French was thought fashionable explains easily how Reaumur's scale popped up where it was not at home.

Since Mr. Fahrenheit was also a member of the Royal Society of England, it was not implausible that the English should have adopted (particularly as it apparently qualified by staying away from decimal figures, for which the British must have a strong dislike) the Fahrenheit scale.

A Consulting Engineer
Erlanger, Ky.

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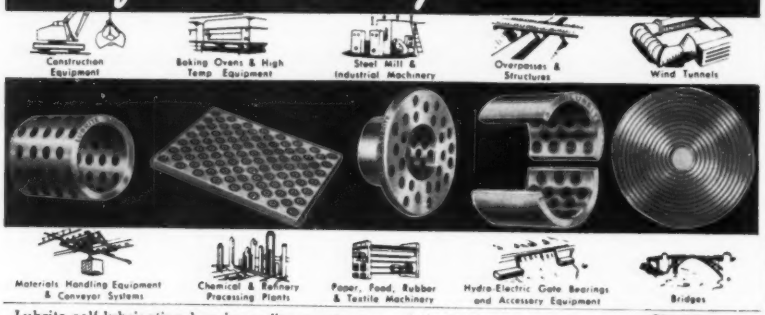
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P. E. Roberts, Exec. Sec.
Illinois Society of Prof. Engrs., Inc.
Champaign, Ill.

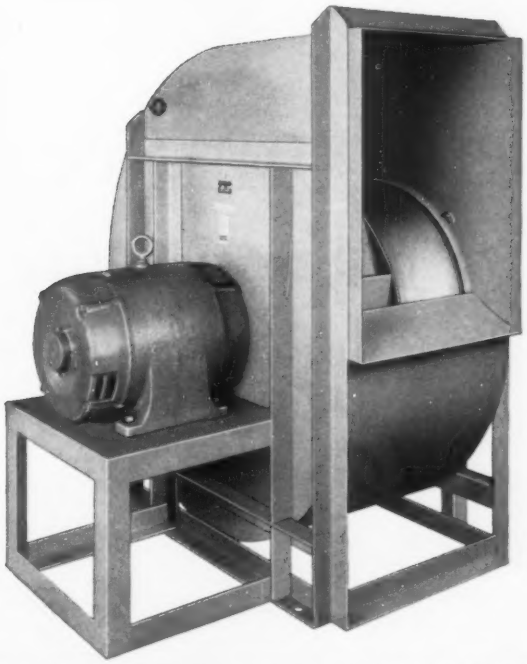
Flood from Europe

Sir:

I am a consulting engineer with Rader and Associates, Miami, Fla. Recently I have moved to the Dominican Republic as a permanent consultant for a group of 14 companies. Since the companies I am associated with here are extremely wide in their scope of operation, I would like to build up as complete an American manufacturers' literature file as possible. The local area is flooded with all types of European literature. Therefore, I will appreciate it if you will send me all of the literature shown on the attached card. If any of this literature is available in the Spanish langauge, copies will be appreciated.

One of the companies in the group is a construction firm which has about $20 million worth of contracts under construction.

William S. Gardner, Jr.
Ciudad Trujillo
Dominican Republic



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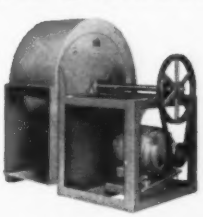

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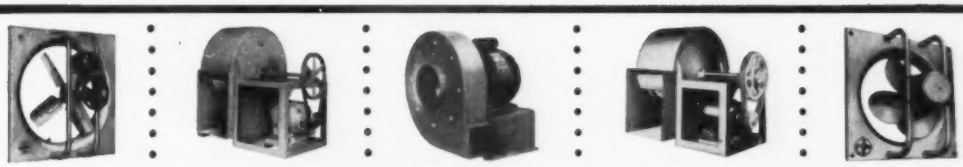

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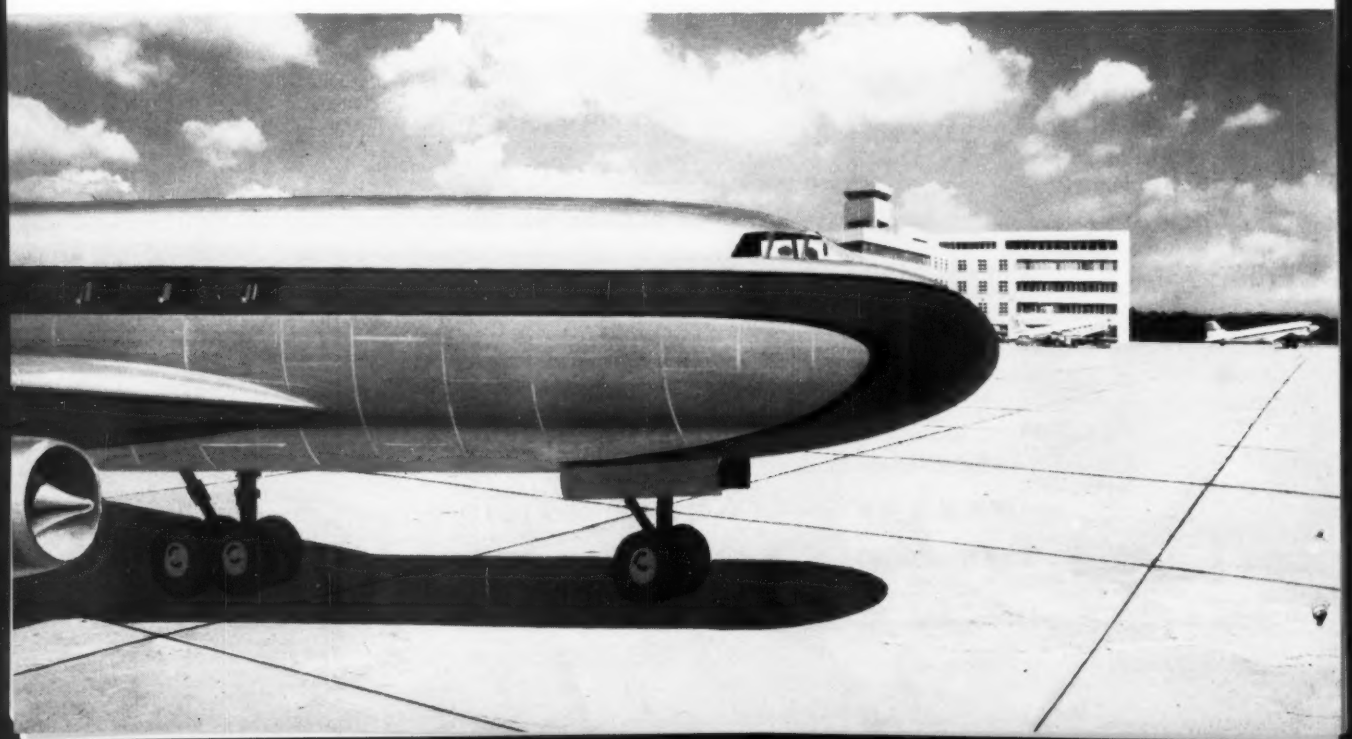

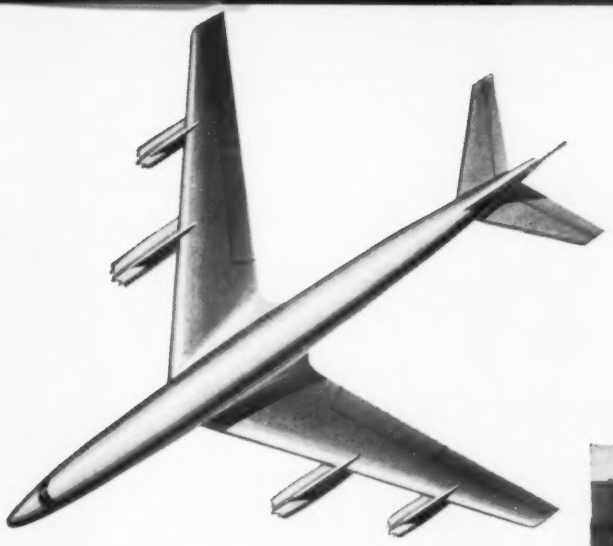

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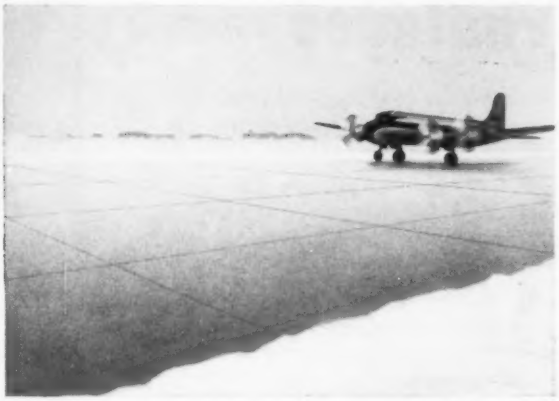

Airports of tomorrow will find the solution to snow removal problems in automatic *steel pipe* snow and ice melting systems which will keep runways open and loading areas clear as in this simulated illustration.

Proof that Steel Pipe Snow Melting will be effective for airport runways, ramps and aprons may be found in the "prototype" installations of snow melting systems on the Indiana Turnpike, Staten Island Ferry ramps, New York Bus Terminal approaches and countless loading docks, airport hangar aprons, sidewalks and plant approaches. Similar Steel Pipe Radiant Heating systems serve, too, in great new airplane hangars at Trans-Canada's Malton, Ontario Field, O'Hare Field, Chicago, and elsewhere.

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- Lowest cost with durability
- Strength unexcelled for safety
- Formable—bends readily
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- Sound joints, welded or coupled
- Grades, finishes for all purposes
- Available everywhere from stock

Indiana Turnpike Toll Plaza after a heavy snow shows effectiveness of automatic Steel Pipe snow melting.

Send for this FREE booklet

A free 48-page booklet, "Steel Pipe Snow Melting and Ice Removal Systems" containing valuable engineering data, is yours for the asking. Write for it today.

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Wing

REVOLVING HEATERS

offer all these advantages

Hot Blasts and Cold Spots Eliminated In Wing Revolving Unit Heaters, the warm air outlet rotates slowly and continuously. This movement of the revolving outlet sets up a gentle air motion which distributes the heat evenly, and eliminates those hot and cold spots caused by stationary heaters.

Because of the constantly changing direction of the warm air, it finds its way around obstructions, such as machinery in manufacturing plants, cars and buses in repair garages, airplanes in hangars, etc.

Fewer Wing Heaters Needed The old concept of unit heaters spaced every 60 or 80 feet doesn't apply with Wing. Wing's largest Revolving Heater, for example, covers over 125′ x 125′.

In a large building this means fewer heaters, much lower installation and maintenance costs. In a building 125′ x 420′, for instance, 4 Wing Revolving Heaters do the job of 12 stationary heaters–without uncomfortable hot blasts or cold spots.

60 Foot Ceilings, And Higher Many thousands of high ceiling Wing Revolving Heaters have been installed where efficiency and comfortable heat are paramount.

Equally Effective with Low Ceilings Wing's line of adjustable discharge outlets provides efficient heating regardless of ceiling height–from 8 feet up.

Low Outlet Temperature Because of Wing's exclusive heating section design, low pressure heating comfort can be obtained with any steam pressure up to 200 psi.

For complete detailed information on Wing's line of Revolving Unit Heaters contact your local Wing Representative or write our Main Office in Linden, N. J.

L. J. Wing Mfg. Co.

DIVISION OF AERO SUPPLY MFG. CO. INC.

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FACTORIES: LINDEN, N. J. AND MONTREAL, CANADA

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OTHER WING PRODUCTS:

- Fresh Air Supply Heaters
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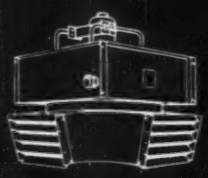
WC101

For Ceilings

8 FEET HIGH TO

60 FEET HIGH

AND OVER

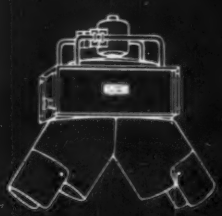


FOR CEILINGS

8 FEET TO 21 FEET

FOR CEILINGS

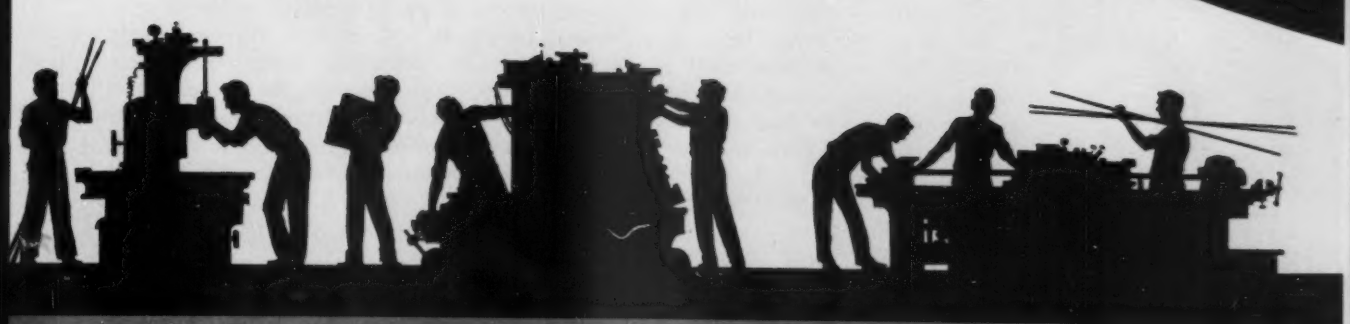
10 FEET TO 27 FEET



FOR CEILINGS

12 FEET TO 60 FEET

AND OVER



The Reader's Guide

Tornadoes and Earthquakes

In this issue there are two articles dealing with the destructive forces of nature. One tells about engineering studies of the damage done by last year's Mexico City earthquake. The other is an important piece on the characteristics of tornadoes. It is interesting to note that whether the natural force is high wind or earth movement, a building stands or falls according to the quality of design and the materials that went into its construction. Well built buildings seldom are damaged by either high winds or earth tremors, while poorly built structures fall apart with the first high gust or the first quick quake. It is up to the engineer. If he designs sturdily, specifies good materials, and supervises the construction to see to it that his instructions are followed, his building will stand undamaged while others fall around it. The article "Tornadoes – And How to Handle Them," (page 80) was written by George W. Reynolds, of the University of Michigan. Reynolds has been working with weather one way or another ever since his student days, and he probably knows as much about tornadoes as any man in the country. Mary Saint Albans does not pretend to know much more about earthquakes than she learned first-hand during the Mexico City upheaval – but she knows the men who do. Her reports tells what Mexico City's top engineers now know about earthquake damage and how to avoid it. See "Report From Mexico," page 142.

And Hammering Waters

On a somewhat smaller scale, water hammer, too, is a destructive force, and while it is never as awe-inspiring as a tornado or a quake, its cost to industry may be greater. And it is certainly more controllable. S. Logan Kerr, author of the article, "Water Hammer – A Problem in Design," says that all too little is known about water hammer, but he then goes on to refute that by proving that he knows a great deal about it. Kerr is recognized internationally as an authority on hydraulics, and much of his work is done as a consultant to consultants. He has had clients as different as the King of Iraq and the St. Louis County Water Company. In his article he points to the troubles that can arise for the consulting engineer who relies too much on manufacturers for guidance in special hydraulics problems. He gives a good summary of water hammer theory, and he concludes with the sensible suggestion that the consulting engineer who gets in over his head in water problems call on a specialist to rescue him. Kerr's article starts on page 88.

To The Salt Mines

Linvil G. Rich, Associate Professor of Civil Engineering at Illinois Institute of Technology, has found out what we should do with radioactive wastes – at least until the time we can plant them on the other side of the moon. He thinks we should send them to the salt mines. He has collected data showing that there is enough space in worked out salt mines to permit the storage of all the radioactive wastes we could produce. These man-made caverns have rooms 50 by 100 feet with ceilings 70- to 90-ft high. They are from 800 to 2000 feet below the earth's surface and would seem ideal for the storage of anything no one wants. This also would be an ideal method for disposal of old razor blades, though Professor Rich seems to have overlooked this possibility. Radioactive waste disposal is, unfortunately, a most serious problem. Some of the isotopes take centuries to decay, and unless got well out of the way, they could endanger the health and even the lives of our children and our children's children. You will be interested in the details of Professor Rich's practical solution. See "Disposal of Radioactive Waste," starting on page 98.

KOOL KOIL

FABULOUS NEW ADVANCE FLUORESCENT LAMP BALLAST...

guaranteed to operate 15 to 20 degrees cooler

up to 15% more light output . . . increases ballast life 3½ to 4 times

eliminates use of costly radiators

HERE'S THE PROOF—

ADVANCE TRANSFORMER CO. • 2950 NORTH WESTERN AVENUE • CHICAGO 18, ILLINOIS

Here's the KOOL KOIL PROOF

AVERAGE TEST DATA* IN 40 C. CBM AND UL HEAT BOX

BALLAST TESTED	MAXIMUM COIL TEMP. °C	MAXIMUM CASE TEMP. °C	WATTS LOSS	LAMPS WATTS (147 Standard)	PERCENTAGE OF LIGHT OUTPUT
ADVANCE CAT. NO. RSH-2E75-S	89°	74°	23	145	97.0
Ballast "A"	108.5°	86°	26.5	139	93.2
Ballast "B"	105°	87°	28.5	137	89.8

AVERAGE TEST DATA* — REPRESENTATIVE FIXTURES

METAL SIDES AND PLASTIC DIFFUSER — 4-LAMP SURFACE MOUNTED

ADVANCE CAT. NO. RSH-2E75-S	100.5°	87°	23.5	122.5	82.2
Ballast "A"	124°	103°	25	111.0	74.5
Ballast "B"	117°	102°	27	108.0	72.5

DROPPED PLASTIC SIDES — GLASS BOTTOM — 4-LAMP SURFACE MOUNTED

ADVANCE CAT. NO. RSH-2E75-S	102°	89°	24	118	79.0
Ballast "A"	127°	105°	25	107	71.9
Ballast "B"	119°	104°	27	104	69.8

GLASS BOTTOM — 6-LAMP RECESSED TROFFER

ADVANCE CAT. NO. RSH-2E75-S	91°	76°	22	115	77.2
Ballast "A"	113°	91°	23	105	70.4
Ballast "B"	105°	94.5°	25	102	68.3

GLASS BOTTOM — 4-LAMP RECESSED TROFFER

ADVANCE CAT. NO. RSH-2E75-S	99°	86°	22	111	74.5
Ballast "A"	120°	101°	24	104	69.8
Ballast "B"	117°	102°	27	100	67.3

*TEST DATA COMPUTED WITH CERTIFIED (CBM) BALLASTS AND (2)F96T12 LAMPS.

The new ADVANCE KOOL KOIL Fluorescent Lamp Ballast is the greatest forward step in the history of fluorescent lighting . . . IT SOLVES THE HEAT PROBLEM!

This ADVANCEment required three years of exhaustive research, development and testing new grades of steel, wire, insulation and compounds. As a result, ADVANCE now brings the lighting industry the new KOOL KOIL series-sequence ballast that operates 15 to 20 degrees cooler, gives 15% more light output and increases ballast life 3½ to 4 times.

TECHNICAL DATA—ADVANCE KOOL KOIL BALLAST—CAT. No. RSH-2E75-S

CATALOG NUMBER	LAMP TYPE	NOMINAL LAMP WATTS	RATED LAMP CIRCUIT M.A.	CIRCUIT VOLTAGE	LINE CURRENT (AMPS)	WATTS LOSS	OPEN CIRCUIT VOLTAGE	DIMENSIONS IN INCHES			
								LENGTH	WIDTH	HEIGHT	MOUNTING
RSH-2E75-S	(2)F96T12	74	430	118	1.5	24	775	14 5/16"	3 7/64"	1 25/32"	13 1/4"
	(2)F72T12	55	430	118	1.5	24	775	14 5/16"	3 7/64"	1 25/32"	13 1/4"

How You Serve The Private Client

Perhaps the most vexing business problem of the consulting engineer has to do with the selling of his services. How can the ethical engineer explain to a prospective client what he can do for him that will result in a better finished project at a lower cost? It makes no difference how well established, how distinguished a consulting engineer may be, he still has some selling to do when he comes face to face with a prospective client who thinks the use of a consultant is a waste of money. We decided to find out what ways and means some of the most successful engineers in the country are using to tell their story in an ethical manner. To do this we put the topic before our Committee of One-Hundred, prominent consulting engineers from all parts of the country, representing all branches of the profession. It was not a simple topic, for it took a full page of type just to state the questions, and most of the Committee answered with manuscripts that ran from five to ten closely typed pages in length. The questions asked what the consulting engineer has to offer the private client, the public client, and the architect client. It turned out that each of these client types required separate treatment, so the first of three scheduled articles appears in this issue. It deals with what the consulting engineer has to offer the private client. It gives every reader facts that will help him sell himself to a prospective client who is the owner or manager of some private enterprise. "How the Consulting Engineer Serves the Private Client," starts on page 116.

Published Fee Schedules

Every week or so we hear of some group that has prepared another fee schedule for consulting engineers. We knew that there were plenty of fee schedules floating around, some good, some bad, some old, some new, but no one seemed to know exactly who had published schedules and how copies could be obtained. That is the kind of situation that demands a bibliography, so we undertook the job of compiling one. We wrote to every state and regional Association of Consulting Engineers, every State Society of Professional Engineers, all the Founder Societies, and all the other national engineering organizations that conceivably could have published a fee schedule. We even went beyond our borders and asked for Canadian fee schedules. We think that we now have assembled a rather complete bibliography of schedules and manuals of practice. Now you will be able to know where to get a schedule of fees for work in any state in which a schedule has been published, and organizations will find the bibliography most valuable in preparation of new schedules or the revision of older ones. (Some of the old ones really need revision. Iowa shows per diem professional fees as $17.50 to $50.00). This bibliography of fee schedules starts on page 106. Reprints will be available.

Specifying Maintenance

Skidmore, Owings & Merrill, the architectural firm, is getting a new service from the consulting engineers working with them. With the great amount of complicated mechanical and electrical equipment that goes into a modern monumental building and with the new materials being used for curtain walls, it is obvious that maintenance is of paramount importance. So Skidmore is having their consulting engineers prepare maintenance manuals and even train crews of maintenance men to take over when a building is put into service. Francis L. Frybergh, of Skidmore, Owings, and Merrill, is the author of the article "Specifying for Maintenance" that will be found on page 93.

Checking Up

We are interested in finding out how the Krick Weather Forecast turned out for April. No doubt a great many of our readers checked this forecast against actual weather conditions, and we would appreciate those of you who did check writing us and letting us know how Dr. Krick stacked up against the daily local forecasts and the weather as it truly occurred. We have been checking here in Michigan, and while the Krick forecast has been off occasionally, it is ahead of the weather man. On a trip to Washington, D. C., we found Krick absolutely correct for the three days we were there, while the Weather Bureau was running in reverse. How did we do in your area?

8 reasons why

Now! Fibrocel made even better through Johns-Manville Insulation Research

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Apply Fibrocel to all hot and cold water pipes, dual service and steam lines from 35F to 300F in buildings like these:

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FIBROCEL® PIPE INSULATION

is the new standard for all commercial service

J-M Fibrocel has been the outstanding insulation in the low pressure field ever since its introduction three years ago. Now thanks to new findings by Johns-Manville's insulation research, it is even better in many ways. Today you get all these advantages in Fibrocel insulation:

Cleaner, sharper edges . . . Tight, snug-fitting edges provide better heat control, smoother appearance.

Smoother, harder surface . . . Normal abrasion and abuse in service cannot damage surface.

Firmer, stronger structure . . . Fibrocel resists compression and abuse. Gives back-up protection against puncture of jacket or vapor seal.

Heavier, smoother canvas . . . New canvas covering provides maximum protection and appearance.

plus these features always associated with Fibrocel:

No shrinkage . . . Joints stay tight . . . no unsightly gaps or costly repairs.

Easy to install . . . Fibrocel is light and easy to handle, is readily cut with a knife.

High thermal effectiveness . . . Tiny particles of silica are exploded and expanded to form a cellular structure of heat-trapping dead air spaces.

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Write for free illustrated 8-page folder, IN-155A. It includes physical properties, insulating characteristics, sizes and thicknesses available. Address Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

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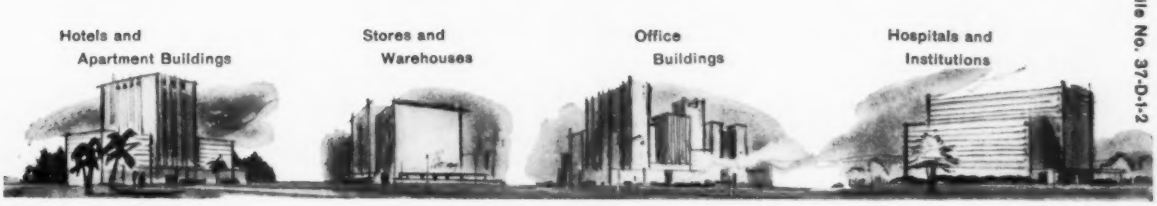


A.I.A. File No. 37-D-1-2

Old and new Carquinez Strait Bridges. Total length of new span is 3,350 feet, four lanes wide. New south cantilever section and part of suspended span appear in foreground at left. Work on north tower, at far right, is in progress. Designer: California Division of Highways. Fabricators and Erectors: American Bridge Division, United States Steel.

Going up:

The Bridge in which USS "T-1" Steel saved $800,000

The Carquinez Strait Bridge is the first major bridge use of USS "T-1" Constructional Alloy Steel, the first large bridge in which all truss members were fabricated by welding, and unique in that the specification of an alloy steel saved $800,000 in construction costs alone.

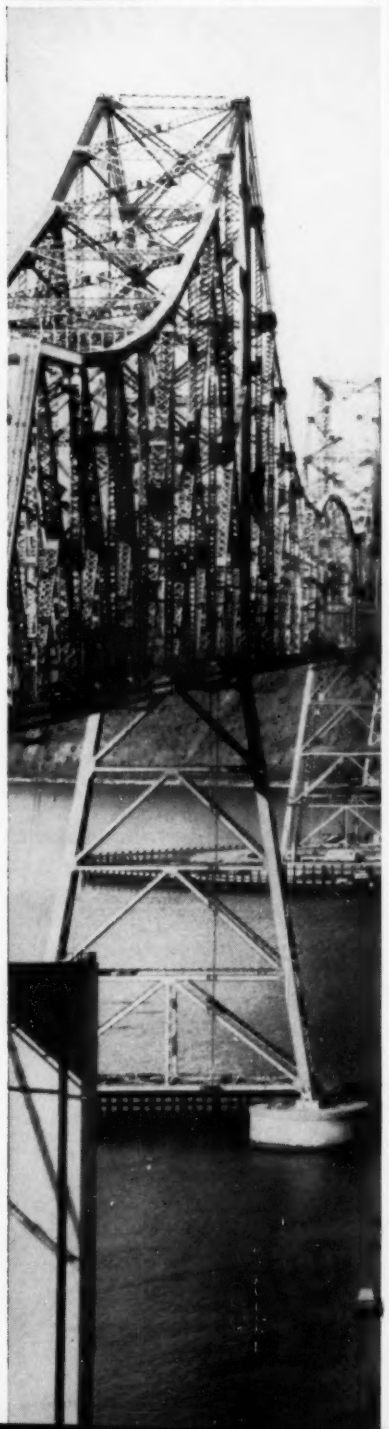
Like its 31-year-old counterpart, it will connect the San Francisco Bay area with the Sacramento Valley. In profile, the two bridges look like twins, but are vastly different in construction. First, to build the wider, heavier bridge without exceptionally massive members, a weldable, tremendously strong steel was needed. USS "T-1" Steel's yield strength (90,000 psi minimum), combined with its weldability, filled the bill—cutting weight of some members by nearly one-half their equivalent A242 design, and saving $800,000.

Second, welded construction in the new bridge will greatly minimize maintenance expense. It costs about $70,000 yearly to clean and paint the old bridge. By getting rid of thousands of vulnerable rivet heads, edges, lacing bars and angles in the new bridge, members will be less susceptible to corrosion and far easier to maintain.

All in all, 2,910 tons of "T-1" Steel are used in the bridge's most heavily stressed members. Also used: 5,370 tons of USS TRI-TEN Steel, a weldable high-strength low-alloy steel, and 6,440 tons of structural carbon steel. Each of these steels—all available from United States Steel—plays an important role in the bridge, helping to make possible the "most bridge for the money."

For more information. Write for our comprehensive books entitled "T-1" and "TRI-TEN." You'll find in them a wealth of engineering and metallurgical data. Or, contact our nearest representative—you'll find him listed in the telephone directory. United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

USS, "T-1" and TRI-TEN are registered trademarks



Three things make the new Carquinez Strait Bridge unique in bridge engineering: first, the use of USS "T-1" Steel; second, the use of shop-welded truss members; third, the exclusive use of high strength bolts for field connections.

United States Steel Corporation – Pittsburgh
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Warehouse Distributors
United States Steel Export Company

United States Steel

Scraps & Shavings

THE RULES OF PROFESSIONAL ETHICS are sometimes hard to understand. Every item in the Canons of Ethics and the other codes are open to some degree of interpretation and adjustment to particular circumstances. Only in the most obvious infractions can one say with authority, "That was an unethical action." Most discussions at meetings or in hotel lobbies at conventions have to do with borderline cases – those thousands of grey activities – those instances in which the accused is positive he was guiltless, while his accuser is equally as certain that his soul was black with sin. There is some excuse, then, for a difference of opinion, but there must be some sort of limit to disagreement.

It was with surprise, therefore, that we noted the action of the NSPE Board of Directors at their February meeting in Lansing, Michigan. *American Engineer*, official publication of the Society, since has published this item under the heading, "Board Action: Report Accepted – Functional Section for Consulting Engineers in Private Practice." The item read, "*Ethical Practices* – It has been reported to this Section that in some instances consulting engineers have been retained by governmental agencies to check plans prepared on behalf of that agency by other consultants . . . apparently without knowledge of the first (designing) consultant.

"After study we have concluded that basically there is no violation of stated or implied ethical practices."

But after reaching this startling conclusion, the same group, apparently guided by Task Force No. 3, recommended that ". . . in the case of a client desiring to have his consultants' work reviewed by another consulting firm or individual outside the client's regular staff, that such review be conducted in line with the rules of professional conduct."

Now, if the Section is correct in its first conclusion and it *is* ethical for one consultant to check on another consultant's work without his knowledge and consent, then to just what extent would one have to go to conduct a review of another consultant's work in an unprofessional manner?

This action recommended to the Board of NSPE is one of the most remarkably uninformed statements we yet have heard from a committee connected with any engineering organization. Basically their recommendation states that one can be unethical if, while being unethical, one conducts oneself in line with the rules of professional conduct. No wonder the Founder Societies shiver at the thought of turning over to NSPE the policing of professional ethics for all engineers.

According to the Code of Ethics of the American Society of Civil Engineers, "To review the work of another engineer for the same client, except with the knowledge and consent of such engineer, or unless the connection of such engineer with the work has been terminated is unprofessional and inconsistent with honorable and dignified bearing." We do not see how ASCE could have made it much clearer. Either Task Force 3 has never read the ASCE Code, or they do not care what it says.

Yet, it is a sure bet that some of the members of Task Force 3 and the Functional Section are members of ASCE, and they should have read their own code. If, however, they follow their own interpretation they could and should lose their ASCE membership for unethical activity.

It is possible, of course, that since our copy of ASCE's code of ethics was published the Society has voted to emasculate this portion of the code in the same way they did Item 4 dealing with competitive bidding. If so, ASCE and NSPE now could be in agreement.

This type of thing is discouraging to us, for we strongly support the basic idea of the Coover Report, which assigns technical interest primarily to EJC, engineering education to ECPD, and professional and ethical matters to NSPE. The concept is a good one, but NSPE is going to have to show a better understanding of professional ethics before any other group will think of relinquishing their ethics activities to them. There are enough real problems connected with the interpretation of the vague aspects of ethics without reversing perfectly clear ones.

There are enough tough problems for you to work on, Task Force No. 3, without confusing the few clear statements in the codes. ▲▲

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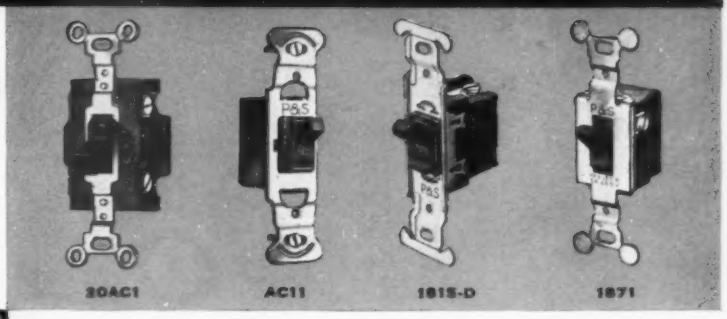
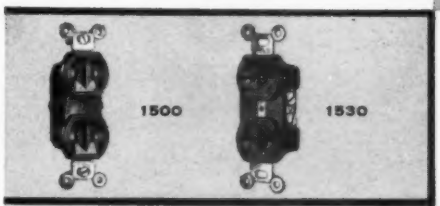
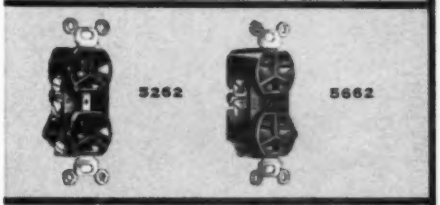




OUTLETS — A range to meet every need. Shown are the 1500 with time-saving screwless terminals and the 1530 T-Slot with dead back.



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TURNLOK — Sturdily built outlets, caps, connectors . . . 2, 3, and 4-wire, 10 and 20 Amps.

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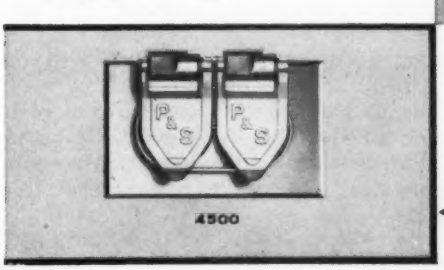

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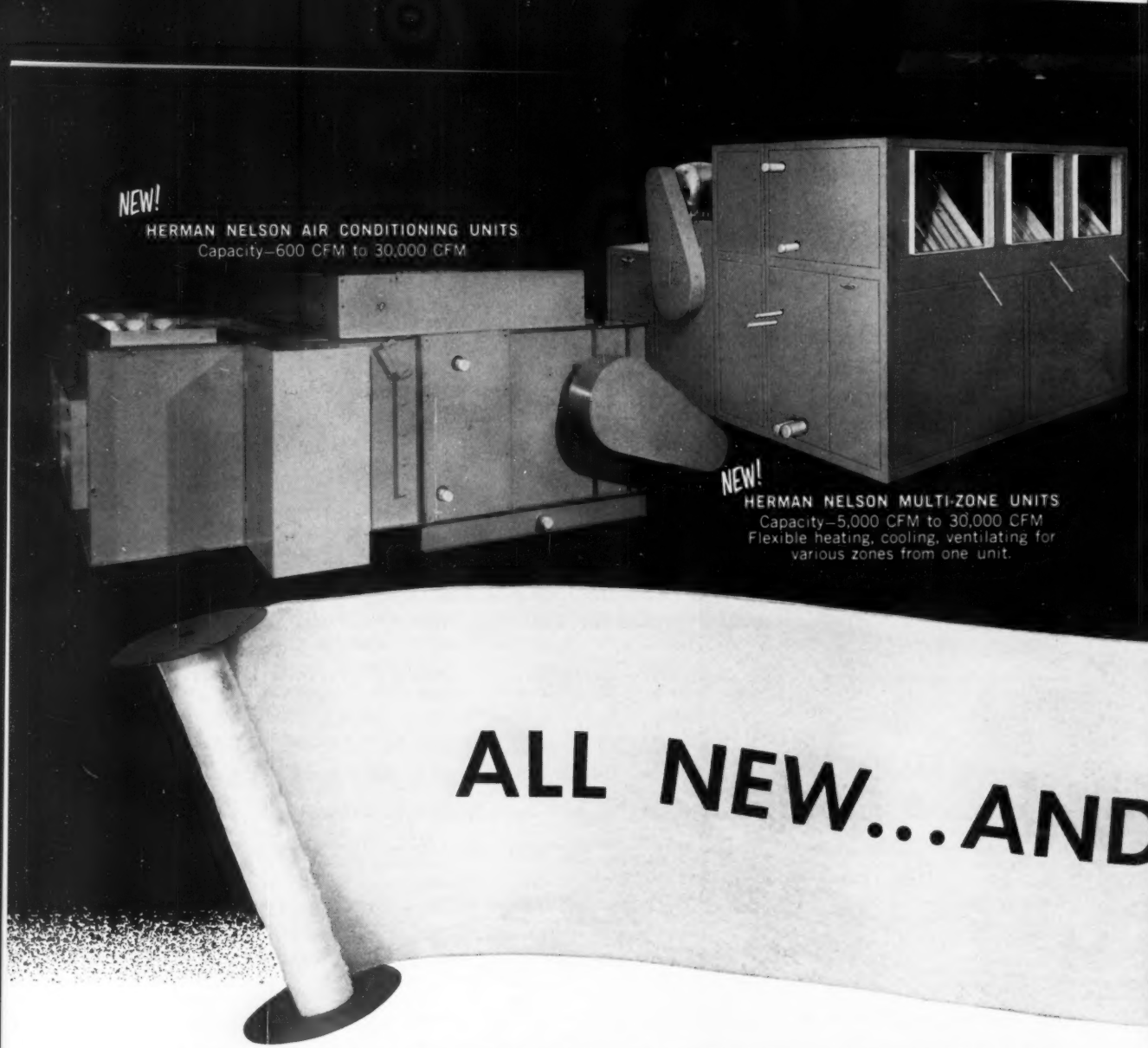
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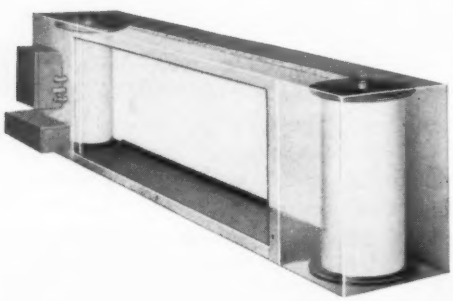
HERMAN NELSON AIR CONDITIONING UNITS
Capacity—600 CFM to 30,000 CFM
NEW!
HERMAN NELSON MULTI-ZONE UNITS
Capacity—5,000 CFM to 30,000 CFM
Flexible heating, cooling, ventilating for various zones from one unit.

ALL NEW...AND

Complete new line of heating, ventilating, air conditioning and multi-zone units change their own filters, automatically

These new AAF-Herman Nelson lines incorporate some of the most advanced features found in any heating, ventilating and air conditioning equipment. Outstanding among these features is the exclusive Roll-O-Vent that automatically changes its own filters. It gives you maximum uniform filtering efficiency the year 'round, with little or no maintenance. Air filtering is always constant, because clean media is fed through automatically and at just the right time. One roll of media does the work of about a year's supply of disposable filters, at about one-half the cost. There's nothing to touch—not even a button. Think of the maintenance saving! Plan your new jobs with these AAF-Herman Nelson units . . . *all new . . . and Roll-O-Vent, too!*



These four great new lines are ready to give you superior performance for any air handling need, large or small. There are 12 basic sizes of each unit—48 in all—handling from 600 CFM up to 65,000 CFM. Sectionalized construction permits installations "tailor made" to your specific requirements.

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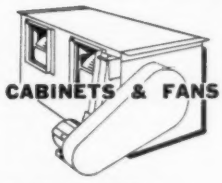

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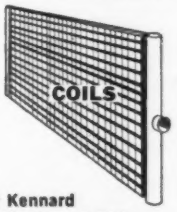

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The Legal Aspect

MELVIN NORD, P.E.
Consultant in Legal and Technical Problems
Patent Attorney

The Law of Real Property: Location of Surface Boundaries (II)

LAST MONTH'S COLUMN discussed a few of the problems of interpretation of metes and bounds descriptions. We now continue this discussion, considering some more specific problems of this type.

Lots Of Trouble

Many descriptions in deeds contain words such as "the west 100 feet of lot 6." This is known as an "Of" description, and is frequently the cause of lots of confusion, as well as confusion of lots.

There would be no confusion if it were not for the fact that it sometimes is not obvious where the starting line for measurement is, and that an "Of" description is ambiguous if the shape of the lot is irregular or if the lot does not run in a direct north-south line.

Measuring Line in an "Of" Description

When a subdivider divides a plot of land into a number of lots and streets, each lot owner technically owns up to the center of the adjoining street (although he has no direct beneficial use of the street because of the existence of a public easement). Therefore, "the west 100 feet of lot 6" might be intended to mean "measured from the center of the street," or "measured from the side line of the street." Since the average person would not be thinking of the street as part of his lot, it is presumed that the measuring line intended in such an instance is the *side line* of the street, rather than the center line.

On the other hand, where the land is not part of a subdivision, but is conveyed by metes and bounds description, "the west 100 feet of lot 6" is measured from the technical boundary line of the lot even if that is within a street. The reason for this result – which is the opposite of that in the subdivision case – is that the grantor has described the land explicitly, so we must presume he had the technical boundary lines in mind when he used the "Of" description.

Another possible source of confusion is the opening or closing of streets. For example, "the west 100 feet of lot 6" still will describe exactly the same space as it formerly did, after an adjacent street to the west of the lot has been vacated in a subdivision. This no longer would be an apt description, since it is clear that the strip referred to no longer touches the western boundary either in a legal sense or in a layman's sense; nevertheless it still describes (or misdescribes) the same land it formerly did.

Direction of Measurement in an "Of" Description

Not only can there be confusion as regards the measuring line in an "Of" description, but in some cases there also may be a question as to what direction the dividing line is to run. This occurs, for example, when the lot is not rectangular but is a nonrectangular parallelogram. Then the question arises, does "the west 100 feet of lot 6" mean 100 feet measured along the north and south boundary lines starting from the west border line, or does it mean 100 feet measured perpendicular to the west border line? The answer is that here there is a presumption that the description refers to a measurement *perpendicular* to the boundary line.

Fractional Conveyances

A frequent type of conveyance is "the west one-half of lot 6." This causes no trouble if the lot is rectangular and has boundaries running north, south, east, and west. Otherwise, there is the possibility that complications may arise.

The first rule of fractional conveyances (under state law in a majority of jurisdictions, as distin-

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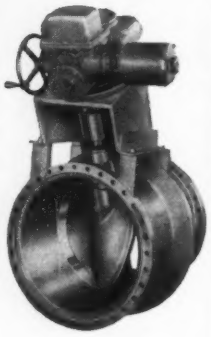

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guished from the original Federal grants) is that a fractional conveyance is presumed to refer to an *area* basis. An exception to the rule (or a rebuttal of the presumption) occurs when the conveyance explicitly directs that the division be by a line which divides a boundary line in half, i.e., "the west one-half of lot 6, measured along the south boundary line." Here the instructions must be followed, even though they result in unequal areas.

Under the area rule, one-half of a lot really is one-half of the lot, just as justice demands. But there sometimes is a question of exactly which half of the lot the grantee gets. That is to say, there may be a problem of which direction the dividing line is to run, if the boundaries are irregular or the lot is not rectangular or is not facing in an appropriate direction with respect to the description. There are an infinite number of ways of dividing an area in half by a straight line, and a description such as "the *west* one-half" very easily may turn out to be extremely ambiguous.

In the case of a nonrectangular parallelogram, this problem is decided by making the dividing line run parallel to two boundary lines, bisecting the other two boundary lines. This is obviously preferable to assuming that the dividing line must run due north and south, just because "the west one-half" was being conveyed, since that would divide the lot into two very peculiarly shaped pieces.

Going one step further, if the lot originally was understood to be a parallelogram, but upon surveying proves to be slightly askew, the presumption is that the dividing line should run as nearly parallel to the sides as possible, i.e., bisecting two boundary lines and running approximately parallel to the other two boundary lines.

However, if the lot is unmistakably irregular in shape or out of parallelism, the dividing line is simply run due north and south, if "the west one-half" of the property is being conveyed.

Other Problems

There are more ways of introducing ambiguities into conveyances than there are legal rules for unscrambling them.

Sometimes two portions of a deed conflict with each other causing, for example, an unintended overlap or gap. Sometimes measurements are called for from a meandering line, such as a river or shore line, which does not stay put. Sometimes it is not clear whether or not a metes and bounds description includes a road owned by the grantor, where the description is "along said road."

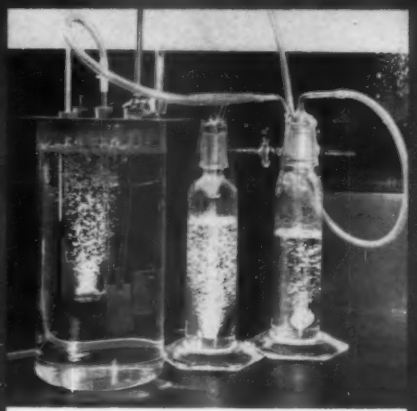
Another type of ambiguity arises where the conveyance grants a certain strip of land "for road purposes." Does this convey the absolute title to the road, or does it merely convey an easement, or right of way, to permit use of the land as a road?

Clearly, we cannot solve all these problems here. But from what we already have seen in this brief ambit of ambiguities, buying land (or a building, since that hardly can help being located on land) is not very much like buying a loaf of bread. Without the assistance of a lawyer and a land surveyor (and a title insurance policy, just to make sure – more or less), one may be letting himself in for some very serious and very unexpected risks and complications. ▲▲

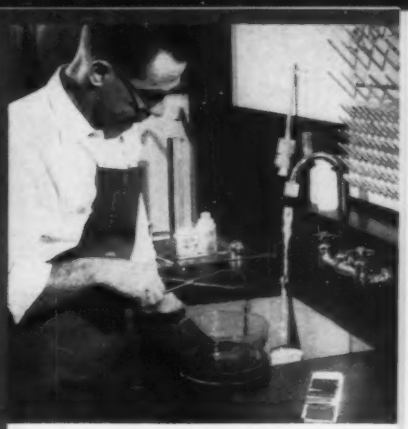
Expert Witness Reprint

Robin Beach's five articles on "The Engineer as an Expert Witness" are available in a 16-page reprint for $1.00. Please write to: Reader Service Dept., CONSULTING ENGINEER, 217 Wayne St., St. Joseph, Mich.

1 Analytical weighing of specimens prior to testing



2 Steam condensate corrosion test



3 Cleaning specimens with inhibited hydrochloric acid

4 Second analytical weighing to determine corrosion weight loss

5 Calculation and statistical analysis of laboratory test results

6 Final examination of specimens under low power magnification

Extensive testing program proves new 4-D Wrought Iron more corrosion-resistant than ferrous substitutes

Test results from the Byers Research Laboratory lend documentary support to the superiority of new 4-D Wrought Iron—over standard Wrought Iron as well as ferrous substitutes.

Convincing case-history service records are now further substantiated by the conclusive findings of our metallurgical staff. Some typical results of this testing program are presented in the chart at right.

The Byers field service representative will be pleased to relate these test results to your corrosive applications. Write us for helpful literature on new 4-D Wrought Iron. A. M. Byers Company, Clark Building, Pittsburgh 22, Pennsylvania.

BYERS WROUGHT IRON

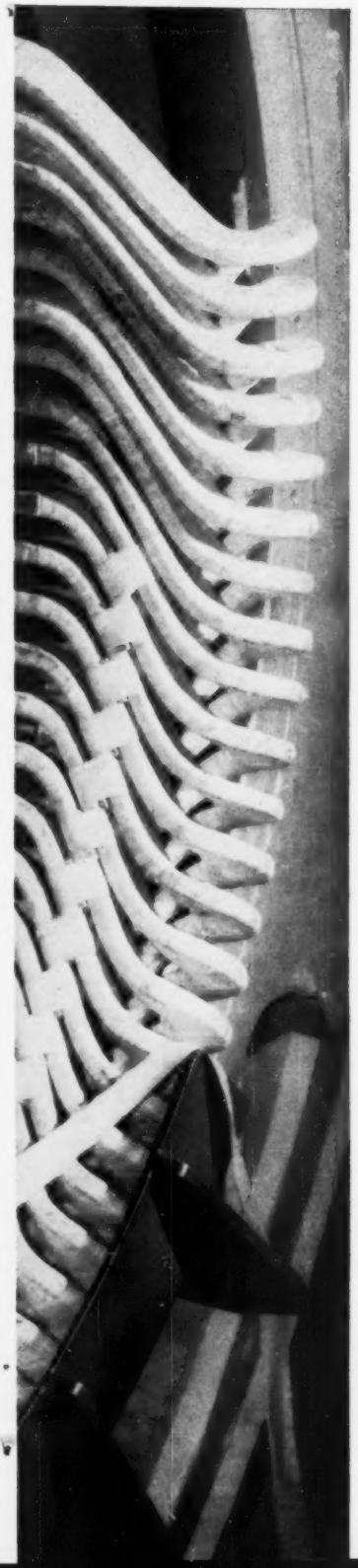
Comparative Analysis of 4-D Wrought Iron Corrosion Tests

Tests	4-D Wrought Iron	Standard Wrought Iron	Ferrous Substitutes
Severe industrial atmospheric continued exposure 17 years	Corrosion weight loss 540 grams/sq. ft.	Corrosion weight loss 655 grams/sq. ft.	Not included in test
Steam condensate return line	*At least 25% greater corrosion-resistance than standard Wrought Iron	No failures 10 years (still in service)	Complete failure after 2 years
Aerated salt water—5 weeks (Short term test—points indicate 4-D Wrought Iron curve flattening out at much lower rate of attack)	Corrosion weight loss 146 mg/sq. in.	Corrosion weight loss 170 mg/sq. in.	Corrosion wt. loss 226 mg/sq. in.
Brine piping	*At least 25% greater corrosion-resistance than standard Wrought Iron	No failures 23 years (still in service)	Complete failure after 7 years
Salt water, Gulf of Mexico ¼ inch plate—17 years	Corrosion weight loss 4 mils/years (minimum plate thickness now $\frac{3}{16}$") Still in excellent condition	Not included in test	Corrosion weight loss 30 mils/years; plate badly pitted, perforated
Downspout	*At least 25% greater corrosion-resistance than standard Wrought Iron	No failures in 29 years (Still in service)	Complete failure after 18 years

*In this application no long term test data yet available on 4-D Wrought Iron. Results shown are derived from short term tests.

How many generators to

produce 24,000,000 kw ?



About 22,000—so far. That is the number of generators Electro-Motive has built during the past twenty years, for a total generating capacity of more than 24,000,000 kw.

As a leading manufacturer of electrical equipment, Electro-Motive has not only produced thousands of generating units, but in the process, has also contributed materially to "improving the breed." Electrical engineers at Electro-Motive are continuously experimenting with new design improvements, new processes that result in more efficient, longer-lived units.

It is this background of experience in production, design and research that stands behind Electro-Motive power equipment. It is your assurance of dependability, economy and long life under the difficult applications of low load factor generation for which they were designed. Why not ask your Electro-Motive representative for additional information?

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The Word from Washington

EDGAR A. POE
Consulting Engineer Correspondent

THE WASHINGTON LIAISON COMMITTEE of the Consulting Engineers Council (C. C. Pate, L. K. Crawford, John K. M. Pryke, and George Heft) recently spent two days talking with government officials and others of importance to consulting engineers.

Deputy Highway Commissioner F. C. Turner, of the Bureau of Public Roads, told the Council representatives that Senate speedup of the vast highway program will mean continued, and perhaps increased, use of private consulting engineers. Senator Albert Gore (Tennessee), chairman of the Senate Committee on Public Roads, reported he is pushing a bill to authorize highway-building appropriations of $900 billion over the next two years, with an additional $400 billion to be spent during the next fiscal year (beginning July 1, 1958). Federal share of these additional appropriations would be boosted to 70 percent, compared to the current 50 percent. Gore favors an additional $2.2 billion expenditure, starting July 1, to further expedite the program.

The committee pointed out to Representative George H. Fallon (Maryland), chairman of the House Subcommittee on Roads, that Council members are extremely interested in the vast Federal highway program and fear that they may not be employed to the full extent of their capacities. Fallon requested a statement from the Council.

CAA Policy on Airport Construction

CAA Deputy Director Merle W. Hemphill, of the Office of Airports, denied that the Authority plans to go into design and supervision of airport construction, saying the department is only an advisory and reviewing agency. He stated further that it is not CAA policy to recommend specific consulting firms to local agencies. If this ever has been done, CAA would appreciate getting the facts so the practice can be stopped.

Washington Office Proposed

The CEC Washington Liaison Committee has become convinced that the Council needs a full-time office operating in the nation's capital. Members found that occasional trips, while important, are not adequate to do the job. Only an alert staff in Washington can watch all the interests of consulting engineers in governmental matters.

Power Politics

The Federal Power Commission estimates that nearly $100 billion must be spent for generating, transmitting, and distributing facilities by 1975. Whether these demands will be met by public or private power is an explosive question in Washington. Power experts say that public power expansion has been slowed under the Eisenhower administration. Nevertheless, public power capacity continues to go up. Now, at a series of hearings ranging from TVA to atomic energy, Congressional committees are tackling the touchy question of public versus private power.

TVA officials and customers maintain TVA must expand to supply the needs of the growing region it serves. The authority is seeking to issue $750 million in bonds.

In opposition, private utility companies are asking Congress to require TVA to pay adequate interest on the over-all investment made in the various states; to pay corporate and excise taxes; and to compensate other Federal agencies for services rendered TVA. They want TVA properties subject to state and local taxes, and they want to limit TVA to its present territory.

The Federal government's more than 100 hydroelectric power projects, like the Hoover, Grand Coulee, and Bonneville dams, are among the world's largest and most dramatic. They are responsible for producing about one-third of the hydroelectric power in the nation. Nearly half of all federally generated power goes preferentially to municipalities, cooperatives, and other public power agencies. Private utilities get some of it for resale, and some is sold to large industrial users.

In 1957 the Senate Public Works Committee reported that generation of power from Federal projects is self-liquidating and returns interest on the Federal investment. However, people living outside the benefited areas frown upon the tax exemptions and special privileges granted to government power bodies. ▲▲

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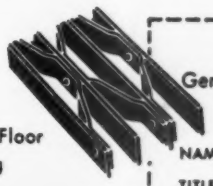

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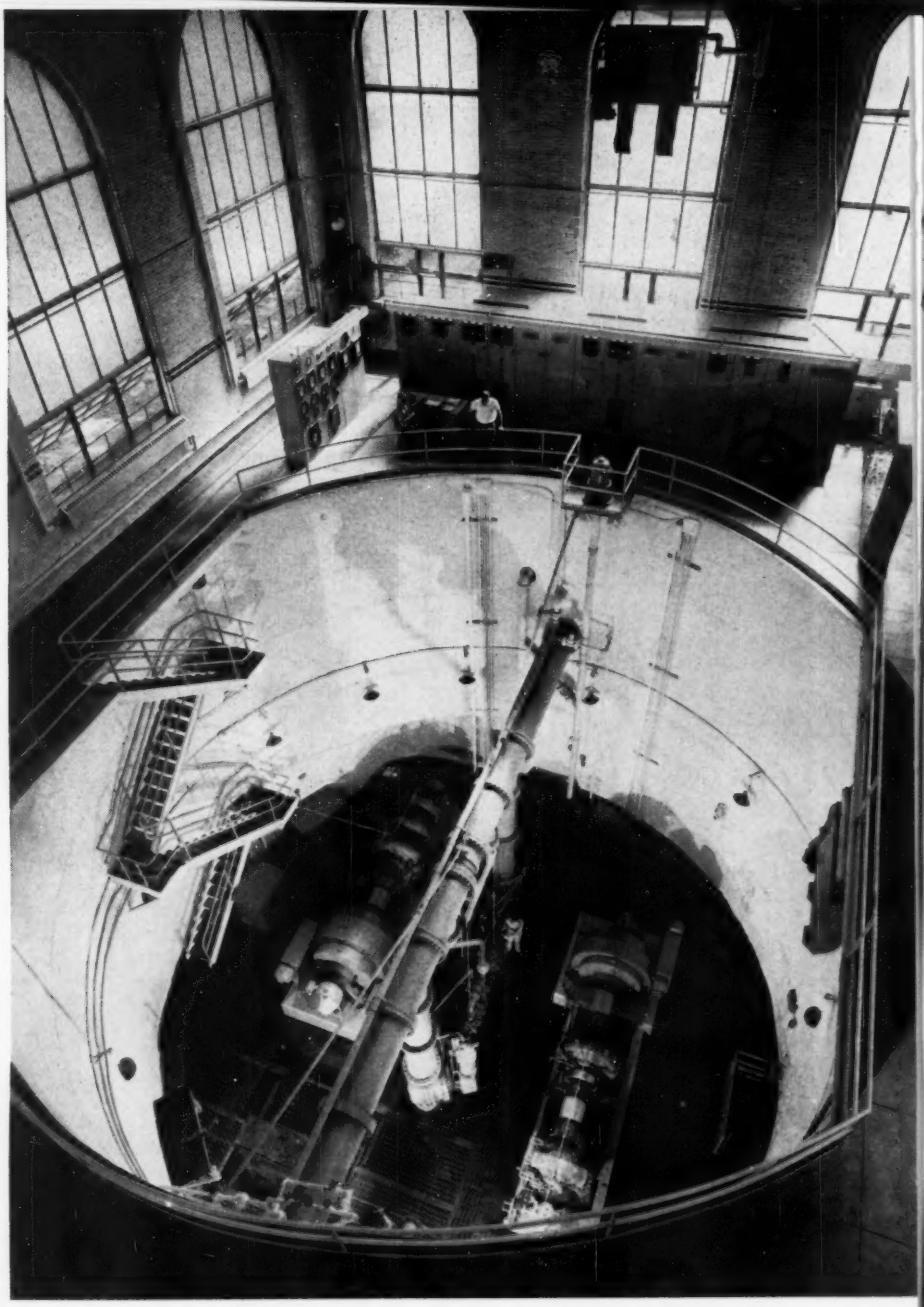
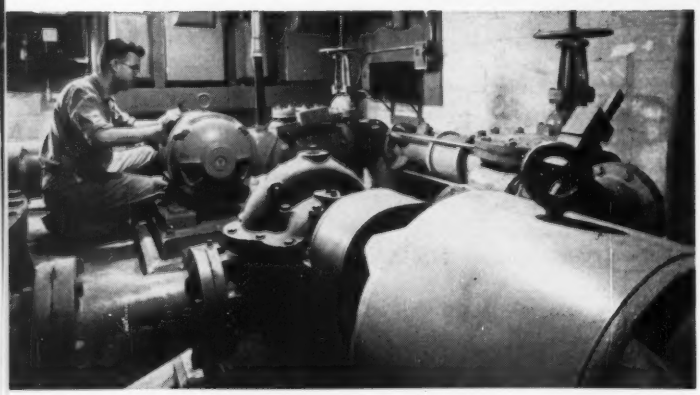
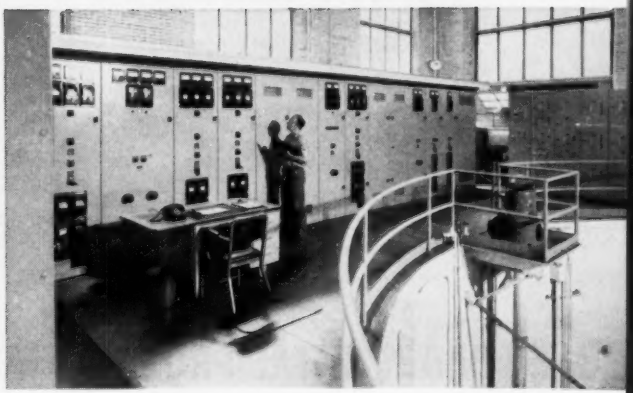


View at Nadine Pumping Station shows south pump pit containing pumps No. 2 and No. 3 with Westinghouse metal-clad switchgear and control center for all station pump motors in background.



Close-up view in booster station shows two 40-hp Westinghouse motor-driven booster pumps, Westinghouse safety switches, motor starters and power factor correction capacitor.



Metal-clad switchgear includes: incoming line section; starting breakers for 1000- and 1250-hp synchronous motors and their auxiliary field control cubicles; starting and running breakers and reactors for two 2500-hp motors.

Water pumping station saves $66,500 annually by Powering-Up electrically

The need for extensive modernization and expansion of water pumping facilities at Nadine Pumping Station of The Wilkinsburg-Penn Joint Water Authority brought about a complete change from steam to electric motor-driven pumps. One new 6.5-mgd pump was added to the three already in use to increase total capacity to 52,000,000 gallons per day.

In addition to the benefits of increased capacity and complete station electrification, comparative figures show a reduction in annual operating costs from approximately $268,000 to $201,500, for a savings of $66,500 per year. This represents an annual return of about 19% on the modernization cost of approximately $350,000. This fast five-year amortization of the investment eliminated the necessity of bond issues or other financing.

Besides the four new pump motors supplied by Westinghouse, the station now contains a line-up of 5-kv metal-clad switchgear, a 150-kva dry-type power center transformer, a motor control center for auxiliary power and a station battery and automatic battery charger.

The electrical Powering-Up of this pumping station has also made possible a more flexible discharge piping arrangement and the electric operation of valves and other equipment.

Powering-Up electrically can mean similar important benefits and savings for you. For further information, call the Westinghouse electrical construction engineer nearest you. He can help you in your Power-Up program. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

Owner: The Wilkinsburg-Penn Joint Water Authority
Consulting Engineers: Morris Knowles, Incorporated
General Contractors: Dravo Corporation
Electrical Contractor: Morganstern Electric Co., Incorporated

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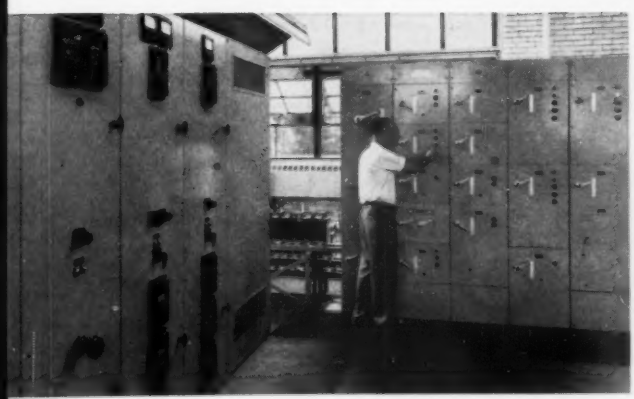

Shown at left is metal-clad switchgear feeder cubicle and 150-kva dry-type transformer. Motor control center at right contains motor starters and feeder breakers for various station auxiliaries.

Engineering group shown includes: George A. Maibach, Chief Engineer, Nadine Pumping Station; G. V. Gustafson, Morris Knowles, Inc., Consulting Engineers; M. B. Trimble, Westinghouse Construction Sales Engineer.

Heard Around Headquarters

STAFF

AT PRESENT, the Producers' Council – Consulting Engineers Council joint committee is appointing representatives of the two groups, and a meeting is to be scheduled soon.

Representing the CEC on the joint venture are L. H. Nettnin, Chicago; and Robert W. LaTour, Cincinnati. John L. Haynes, temporary secretary of the joint committee, said at least three more Council representatives are to be named.

The Producers' Council is represented by John E. Haines, Minneapolis; H. L. Cramer, Pittsburgh; Tyler S. Rogers, Toledo; and Charles E. Stock, Louisville. One more Producers' Councilman also is to be named to the committee.

The joint effort is to be aimed at greater cooperation and understanding between manufacturers and consulting engineers. As its first project, the committee is exploring the possibility of developing a standardized cataloging and filing system for manufacturers' literature and technical publications.

Later projects will be seeking improvement of manufacturers' technical data and promotional literature directed to engineers, cooperating on matters of engineering education, and urging greater recognition for consulting engineers.

Corporate Practice in New York State

The smoke is cleared, and New York State is back to the status quo after three bills on corporate practice were submitted this year – none passed.

One bill, which was backed by NYSSPE and the New York Association of Consulting Engineers, passed the Assembly with no discussion on the floor. However, it was not reported out of committee in the Senate. Therefore, if the bill is to be passed next year, it would have to be resubmitted to both Houses. This proposal was to retain the present law but did list several minor revisions.

The Milmoe bill, supported as usual by the Committee on Engineering Laws, would have permitted corporate practice, with restrictions. Corporations would have been allowed to practice engineering if registered engineers on their staffs did the work. No action was taken on this bill by the New York Assembly or Senate, so this legislation must wait another year.

The McKell bill, which would have eliminated corporate practice, was not reported out of committee in the Senate and was not submitted to the Assembly.

So the five-year pattern in New York State was repeated. "But this does not mean we are quitting," a CEL representative stated.

AICHE Publications

Three historical books are being published by the American Institute of Chemical Engineers in connection with its Golden Anniversary celebration in Philadelphia on June 22-27.

Chemical Engineering Around the World, covering 39 countries (including Russia), will be edited by Dr. E. L. Piret, professor at the University of

PVC PIPING NEWS

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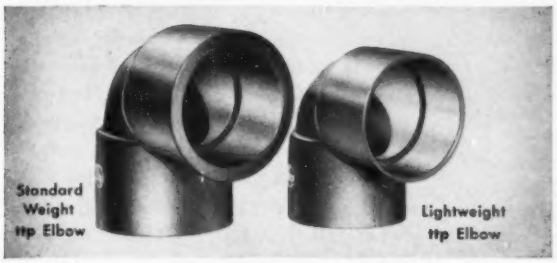

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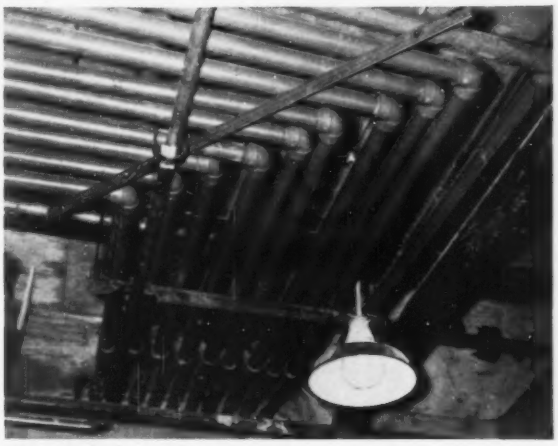

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Minnesota and former Fulbright professor. The chapters will be written by chemical engineers in the country being discussed.

Contributions to the American economy will be discussed in *Chemical Engineering in Industry*, edited by Dr. W. R. Dixon, manager of the design division of the engineering and construction department, at the Atlantic Refining Co., and Dr. A. W. Fisher Jr., manager of business development for the research and development division, of Arthur D. Little & Co.

F. J. Van Antwerpen, executive secretary of the AIChE, will do the *History of AIChE*.

At their Silver Anniversary, the chemical engineers published a book giving the history of their profession to that date.

Foreign Reports

A source of news on international projects which will be awarded in the near future is a relatively new publication — *Tradewinds*, published by Overseas Americans Inc., 7 West 44th St., New York. The latest issue listed several projects on which consulting engineers were to be selected.

Progress in Maryland

The Consulting Engineers Council of Maryland, with 26 member firms, is one year old this month.

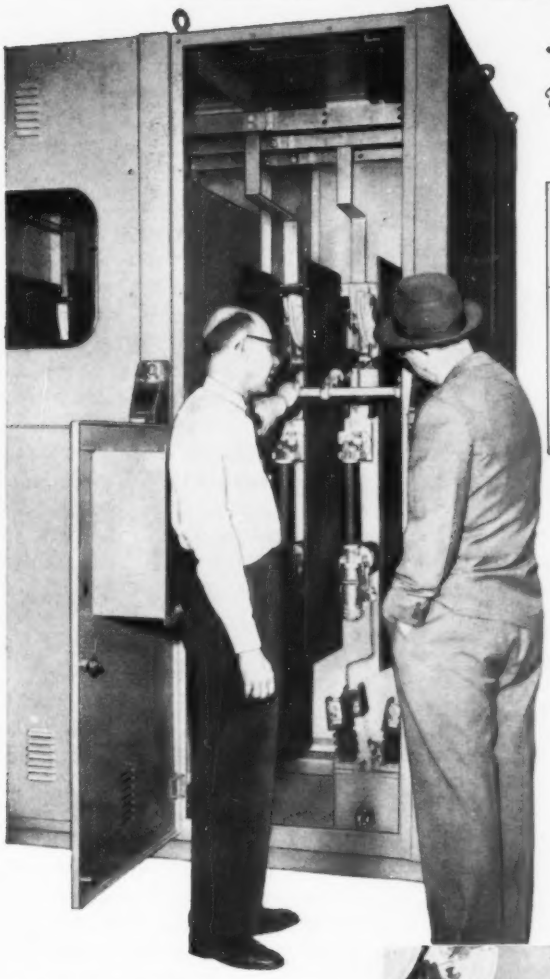
William R. Kahl, Maryland Council president, said the primary activity of his group at this time is the compiling of a fee schedule.

Four task committees — mechanical and electrical, structural, highways and bridges, and sanitation and site surveys — are making detailed studies in their respective fields. However, Kahl said the completed fee schedules will be based as much as possible on existing founder society recommendations.

An Architectural Cooperation Committee will work with Maryland architects on fees where the two groups are mutually affected.

After the fee schedules are completed, Kahl said they will be tied

"...and what's really different about R&IE POWER SWITCHING CENTERS



...the HPL-C Switches will close in on moderate faults."

SAFE CLOSING RATINGS Asymmetrical 3-phase Kva values:

Nom. Voltage	Direct or Chain Drive	TOG-L SNAP, non-current limit fuses	TOG-L SNAP, current limit fuses
2,400	50,000	150,000	250,000
4,800	75,000	250,000	500,000
7,200	75,000	250,000	750,000
12,000	75,000	250,000	1,000,000
13,800	75,000	250,000	1,000,000

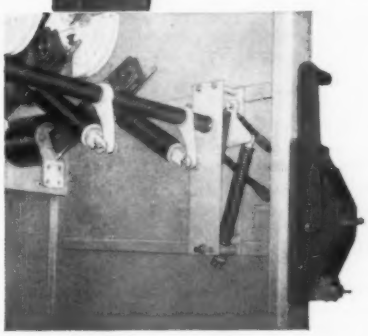
Ever close an interrupter into a short circuit? Ever think of what could happen?

Before it's too late—check the facts on the HPL-C Interrupter Switch, and its safety features.

SAFETY FEATURES—(1) HPL-C closes in on special heavy closing contacts, outside the interrupter—thus preventing damage to the interrupter switch when closing in on moderate fault currents; (2) High velocity "OVR-CENTR" blade closing (and opening) with the TOG-L SNAP operating mechanism—an optional feature, providing additional safety, important especially during the closing operation. For safety sake, specify these important features.

TESTS—Switches have actually closed against moderate 3-phase fault currents at 4.8 and 13.8 Kv—proving that the HPL-C offers a high degree of protection. Ask the I-T-E Representative to give you the performance facts. They will show you how to save on installation costs with standardized engineering; on operating costs by preventing costly shutdowns; on maintenance costs through simple inspection and up-keep requirements and the accessibility to equipment.

RATINGS—Fused HPL-C Interrupter Switches
up to 14.4 KV (110 BIL)
600 Amp. (40,000 Mom.)
1200 Amp. (60,000 Mom.)



RIGHT—*TOG-L SNAP operating mechanism, featuring "OVR-CENTR" spring actuator—optional, but important to safety in closing.*

R&IE EQUIPMENT DIVISION
I-T-E CIRCUIT BREAKER CO.
GREENSBURG, PA.

HPL-2

WHEN YOU SEE THESE GAUGES, YOU WON'T BELIEVE THE LOW PRICES!

New line of standard industrial gauges has Grade A accuracy . . . premium gauge construction . . . at up to 40% below premium prices

Now, you can buy pressure gauges that are sturdier, more accurate, and have many of the top quality features of premium-priced process gauges . . . yet don't cost a nickel more than you've been paying for general purpose gauges. We guarantee that you can't find better values on the market than our new "A" Line.

Be sure to check the new "A" Line models against your specifications for any of a broad range of industrial applications—principally where steam, water, and oil pressures must be indicated.

Consider such remarkable design points as:

MEETS A.S.A. GRADE A STANDARDS — Guaranteed accurate within 1% of scale for the middle (working) half of scale and 1½% for remainder.

WIDE CHOICE OF OPTIONS—Aluminum cases standard, other materials available . . . panel or front-of-board mounting . . . variety of movements and Bourdon tubes . . . dial sizes, 3½ to 12 inches . . . for pressures to 10,000 psi or vacuum.

LONG LIFE AND EASY MAINTENANCE—You can select from a wide range of available components to meet your exact needs for rugged or corrosive service conditions, and be assured of maximum life with minimum maintenance. Entire gauge internals can be removed as a unit for inspection or calibration.

Find Your Nearest Distributor In The 'Yellow Pages'

You'll have to see the new "A" Line gauges to believe all the quality features and options offered at amazingly low costs. Ask your U. S. Gauge distributor for a demonstration today, or write for a copy of new Catalog 305.

UNITED STATES GAUGE
DIVISION OF AMERICAN MACHINE AND METALS, INC., SELLERSVILLE, PA.

USG

in with a public relations program "to tell what we have to offer." The schedules, plus data on consultants, will be circulated widely.

"When the fee schedule gets established, we hope to tackle other problems, such as free engineering by industry," Kahl added.

At the May meeting, the Maryland Council will hear a report on the requirements for Consulting Engineers Council membership.

Although formed last May, the Maryland Council was not incorporated until December. The Council voted to have $100 entrance fees per firm, with $10 annual dues. Kahl said the low annual dues were established because the young organization had $2600 in the treasury, with no definite plans at that time as to how the money should be used other than publication of fee schedules when completed.

As new programs are begun, Kahl said the annual dues probably will be raised.

Application Filed

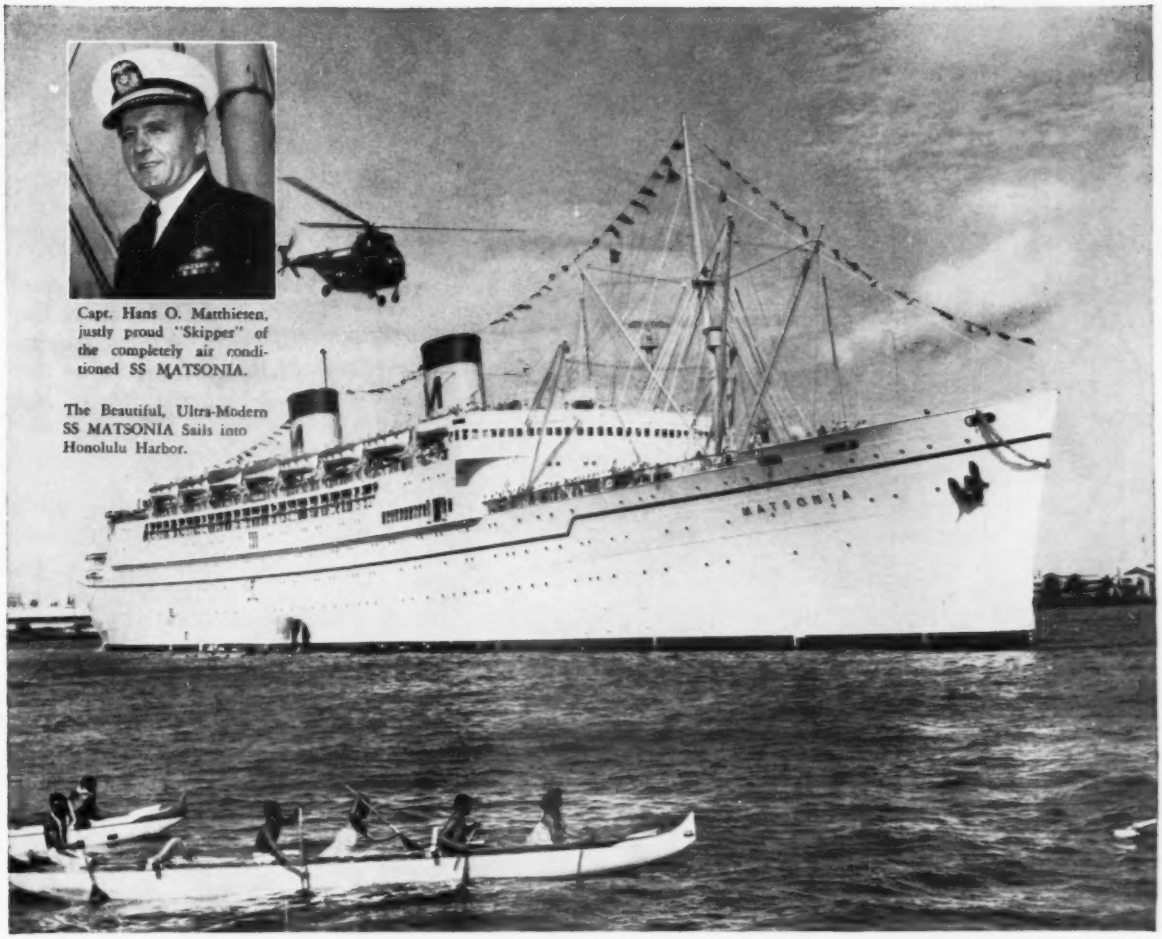
The Houston Chapter of the Texas Association of Consulting Engineers has applied for membership in the Consulting Engineers Council. The 23-member chapter, representing 14 consulting firms, is headed by Damon T. Slator. Other officers are: H. C. Will, vice president; Paul C. Nail, secretary-treasurer; R. F. Taylor, CEC delegate; and James H. Howard, alternate.

Long Island Chapter

Consulting engineers in Nassau and Suffolk counties, on Long Island, have formed a chapter, adopted a constitution and bylaws, and petitioned the New York Association of Consulting Engineers Inc. for a charter.

Julius Schubert, president, said a charter dinner was set for April 18th, with officials of the State Association scheduled to attend.

Bylaws and constitution of the Long Island group are modeled after those of the state organization. However, the Long Island group



Capt. Hans O. Matthiesen, justly proud "Skipper" of the completely air conditioned SS MATSONIA.

The Beautiful, Ultra-Modern SS MATSONIA Sails into Honolulu Harbor.

MATSON LINES DEPEND ON "BUFFALO" FANS FOR RELIABILITY AT SEA

When a major steamship line spends 20 million dollars to modernize a passenger ship, you can be sure that the results achieved far out-weigh the costs.

This is certainly true of the all-new MATSONIA. Unrivalled safety, luxury, convenience and comfort welcome the fortunate passengers who sail on this pride of the Matson Lines. For example, passengers and crew can "tune-in" just the climate they desire in each room by simply turning a dial.

Vital to the MATSONIA's unique, new selective air conditioning and ventilation system is a huge battery of "Buffalo" Fans. It is logical that "Buffalo" Fans were selected for the important air moving job on this super-liner. During the past 81 years, "Buffalo" Fans have earned a world-wide reputation for highest efficiency, extremely quiet operation and long-lasting dependability.

Just as Matson Lines depend on "Buffalo" Fans for *reliability at sea*, so *you* can depend on "Buffalo" Fans for your own air jobs ..ashore or afloat. Insist on "Buffalo" Fans for *your* next air moving project ... expert engineering service is as close as your nearby "Buffalo" representative.

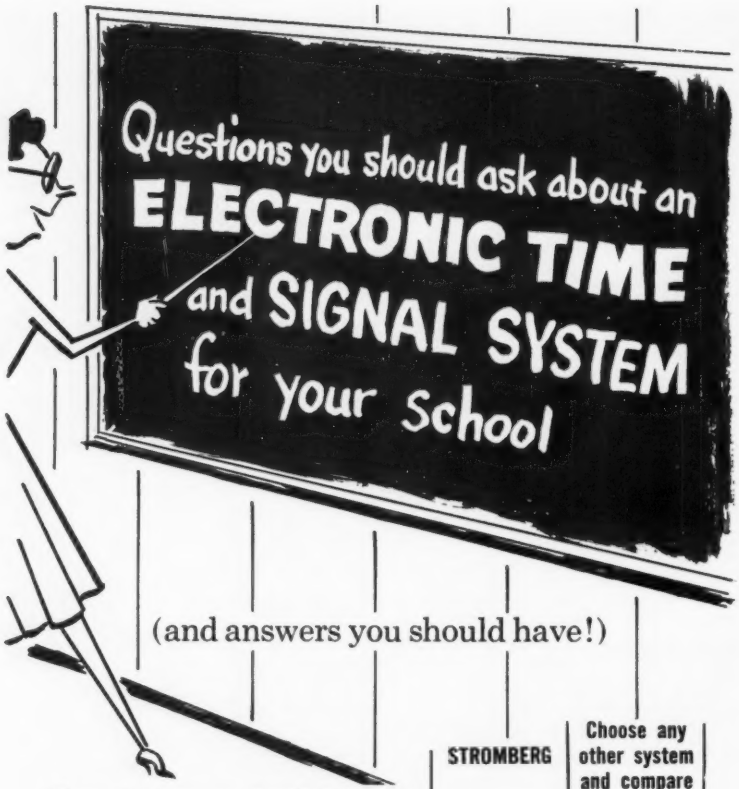
The MATSONIA's Chief Engineer, Helge Lundby, is pleased with the fine performance of this and the many other "Buffalo" Fans aboard his ship.

BUFFALO FORGE COMPANY

Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT
EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING



(and answers you should have!)

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Does it have a jeweled Master Clock movement?	Yes	[ ]
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Are *all* components pluggable for ease of maintenance?	Yes	[ ]

Stromberg's new Electronic Time System is a product of the laboratories of one of the largest clock manufacturers in the world — *YOUR GUARANTEE of performance, quality and dependability.*

For complete details, write:

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set requirements for membership to "a natural person licensed to practice professional engineering in the State of New York." The members also must be consulting engineers during normal business hours, and engaged in the independent practice of consulting engineering.

Interim officers, in addition to Schubert, are Robert Holzmacher, vice-president; Dan Weaver, secretary; Ed Metcalf, treasurer; and John Stahlberg and Horace McAllister, directors.

N.J. Consultants Meet

An organizational meeting for a New Jersey Association of Consulting Engineers was scheduled for late April, according to Harry Terry, Trenton consulting engineer, who called the meeting.

Terry invited representatives of the New Jersey Division of Purchase and Property; State Highway Commission; and Health, Education, and Labor Departments to attend the meeting.

However, he said membership would be limited to licensed professional engineers who are in private practice.

D.C. Group Elects Officers

The Consulting Engineers Council of Metropolitan Washington now is a reality.

The group, formally registered with the District of Columbia, elected Kenneth W. Cobb, of Kluckhuhn, Cobb & McDavid Co., as president.

Other officers are J. Gibson Wilson Jr., vice-president; Morton Wood Jr., secretary; Sholom M. Shefferman, treasurer; James LeMay, Frank Weller, and John Williams, directors.

EJC Survey on Unions

A survey, conducted by Engineers Joint Council among 611 student chapters of the five Founder Societies, showed that union activities on campuses have not yet gone beyond general literature distribu-

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are now more versatile than ever

De Laval IMO pumps have proved that they do a dependable job over long years of service. The reason is IMO design simplicity. These constant displacement rotary pumps have only three moving parts—smoothly intermeshing rotors that propel the fluid axially in a steady flow without churning, pocketing or pulsation. There are no timing gears, cams, valves, sliding vanes, or reciprocating parts to wear or become noisy. *Quiet*, compact IMO pumps are excellent for direct-connected, high-speed operation.

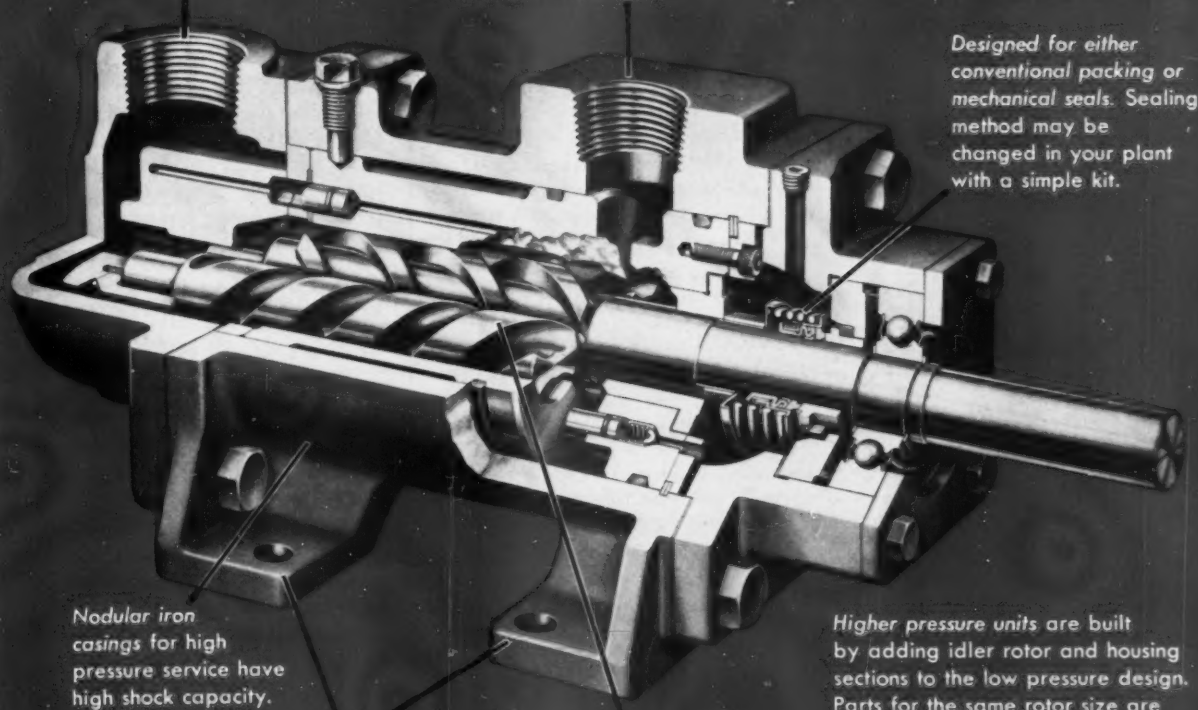
In addition to these basic pumping advantages, the improved IMO gives you important new benefits shown in the cutaway illustration below.

Inlet can be rotated to suit installation arrangement.

Discharge flanges are infinitely varied. You can use the most advantageous piping method to suit installation requirements.

DE LAVAL IMO PUMPS can also be used as hydraulic motors.

Designed for either conventional packing or mechanical seals. Sealing method may be changed in your plant with a simple kit.



Nodular iron casings for high pressure service have high shock capacity.

Higher pressure units are built by adding idler rotor and housing sections to the low pressure design. Parts for the same rotor size are interchangeable over the entire pressure range.

Any position mounting is possible without factory modification.

Internal parts are designed as a package so that units can be built into your machines.

Bulletin 3001 gives data on improved De Laval IMO pumps. Send for your copy today.

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FOR BETTER VALVE AND UNION PERFORMANCE:

FAIRBANKS®

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An unbeatable combination — the "first string" team of valve and union for dependable trouble-free piping installations.

Look at the lineup:

U-01 BRONZE GLOBE VALVE

★ Renewable Composition Disc

Perfect sealing at all times—

A disc for every type of service—

#50—a hard disc for general usage

#52—a rubber disc for cold water valves

#60—a special synthetic disc highly resistant to gasoline, oils and many acids and alkalies.

★ Two Piece Union Bonnet
—Quick, easy disassembly
—No sliding or scraping between body and bonnet—NO WEAR

★ Radial Seat of Two Piece Union Bonnet
—Leak-proof Body Bonnet Joint
—Rigid alignment of all parts—guaranteed perfect seating all the time.

DART UNION

★ Ground Ball Joint having extra wide seating surfaces

★ Two Bronze Seats, non-corroding, on both sides of the seat

★ Leak-proof without excessive torque because of true bearing surfaces

★ High-test air-refined malleable iron body will not stretch, practically unbreakable.

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tion, with one exception. One student chapter, of 337 which replied, said union organizers had been on campus to recruit seniors.

Chapter meetings, to discuss unionization, had been held by 27 groups. At these, attendance was good, but in at least half of these meetings the union side was not presented.

"It is interesting to note that all respondents were unanimous in concluding that no favorable reactions toward unionization have resulted from these meetings. As a matter of fact, most of the respondents were very emphatic in this, bringing up such matters as actual antagonism of seniors to unionization and examples where employment was turned down with companies where union activity is strong," the report stated.

The report recommended that in cases where it is necessary to convince the student that unions are undesirable, programs should present intelligently both sides of the question. "Students, after all, are being trained to think, and they should resent a one-sided presentation or a poorly prepared argument," the report concluded.

Nuclear Congress Plans

Attendance at the Nuclear Congress in Chicago this year was not up to expectations and fell short of the record set by the 1957 Congress in Philadelphia.

So plans already are under way for a "bigger and better" Congress next year (April 5 through 10) at the Cleveland Auditorium.

The 1959 Congress will be under the management of the American Society of Mechanical Engineers and will be coordinated by the Engineers Joint Council. More than 100 papers will be accepted for the science and engineering technical sessions.

Again, the Nuclear Congress will be composed of a Hot Laboratories and Equipment Conference, a Nuclear Engineering and Science Conference, and an Atomic Energy

For high-voltage power circuits...

full short-circuit protection full load switching at minimum capital outlay with S&C Metalclad Switchgear

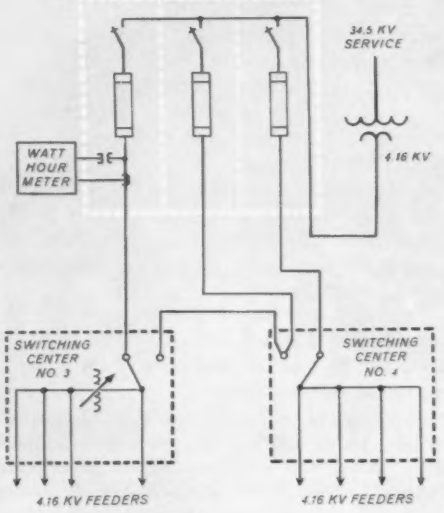
Industrial high-voltage power circuits are free from transient faults. Conductors for such circuits run in cables or conduits. They are not exposed to lightning, falling trees, rodents, wind, or ice which typically cause transient faults.

Consequently, the only faults that occur are permanent faults; thus these circuits cannot be re-energized immediately after an outage. Hence S&C Power Fuses give the right protection against such faults. The quick reclosing feature of expensive circuit breakers is not needed. Nor are circuit breakers (with associated differential relays) for protection against internal transformer faults justified in view of the reliability of modern transformers. This form of protection is particularly unwarranted for the kva sizes found in typical industrial load centers.

S&C Metalclad Switchgear, with power fuses instead of circuit breakers, and load interrupters for full load switching, can bring substantial savings in switchgear costs—sometimes as much as 50%.

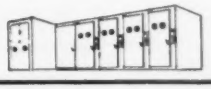
S&C Electric Company, 4436 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

S & C METALCLAD SWITCHGEAR
SERVING AS MAIN SUBSTATION SECONDARY

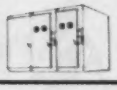


S&C Metalclad Switchgear serving as the main substation secondary at the Riverside plant substation, Universal Oil Products Company, near Chicago. Includes metering provision, two outgoing feeder circuits, and a common spare. Design, layout, and purchasing by Universal Oil Products Company. Electrical contractor: Fried Walters Company, Chicago.

SUBSTATION PRIMARY



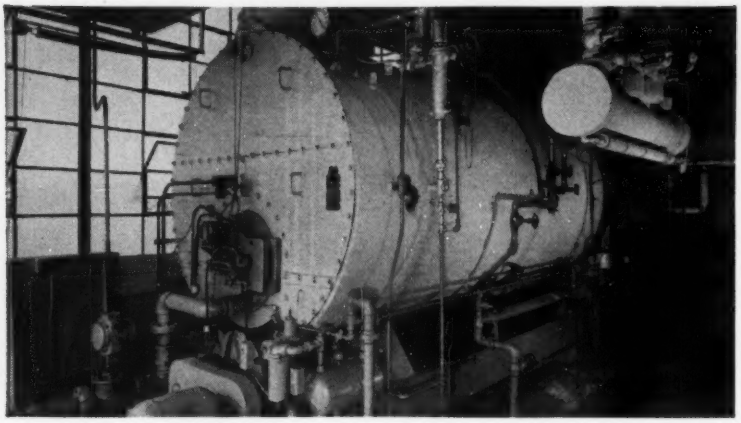
MAIN SUBSTATION SECONDARY



SWITCHING CENTER

SERVICE ENTRANCE

Cleaver-Brooks reports on PROCESS STEAM ECONOMY



34 BOILERS – excellent efficiencies minimum maintenance

— National Industrial Laundries, Elizabeth, N.J.

Mr. Freeman A. Godfrey, Chief Engineer, National Industrial Laundries, states, "From actual fuel checks against steam developed, our company is experiencing excellent efficiencies from our 34 Cleaver-Brooks. Loads vary widely in our 20 plants, starting at 100% capacity in the morning hours and reducing to 20% in afternoon.

"Our maintenance story is just as impressive. Due to better combustion, we find it is unnecessary to clean the fireside of boilers more than once every six months. We have not had a serious shutdown due to any lack of emergency service from your field engineers."

Economy and boiler performance like this are typical of hundreds of Cleaver-Brooks installations. Four-pass, forced-draft design has clearly proved its superiority in all types of process steam service.

Today — write for complete information on Cleaver-Brooks boilers: 15 to 600 hp, oil, gas and combination oil/gas firing, steam or hot water for heating and processing. Cleaver-Brooks Company, Dept. F, 321 E. Keefe Ave., Milwaukee 12, Wisconsin.

The 300 hp oil- and gas-fired model LR boiler shown above is installed at Alabama Overall Service laundry in Birmingham, Ala. In addition to this installation, National Industrial Laundries has a total of 32 Cleaver-Brooks boilers in the following plants:

Atlantic Overall Service Scranton, Pa.
Carolina Overall Service Charlotte, N.C.
Central Overall Service Louisville, Kentucky
Colonial Overall Service Richmond, Va.
Delta Overall Service Hattiesburg, Miss.
Dixie Overall Service Greensboro, N.C.
Eastern Overall Service Somerville, Mass.
Floridian Overall Service St. Petersburg, Florida
Gulf Overall Service Atlanta, Ga.
Industrial Uniform Service Chattanooga, Tenn.
Local Overall Service Ft. Worth, Texas
Mechanics Overall Service Newark, N.J.
Mechanics Overall Service Camden, N.J.
Mechanics Overall Service Reading, Pa.
Mechanics Overall Service Alexandria, La.
Mechanics Uniform Service Dayton, Ohio
Southern Overall Service Baltimore, Md.
Texas Overall Service Dallas, Texas
Texas Overall Service Houston, Texas
Tropical Overall Service Jacksonville, Fla.

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Management Conference – the latter sponsored by the Atomic Industrial Forum and the National Industrial Conference Board. A trade show also will be held in conjunction with the meetings.

Deductible Expenses

For anyone already thinking about next year's income taxes, Paul Lange, secretary of the Engineers Joint Council, pointed out that some personal expenses in connection with professional or technical organizations are deductible.

Lange quoted Ruling 55-4, IRB 1955-1, which states that a taxpayer "who gives his services gratuitously to an association, contributions to which are deductible" under the relevant provisions of the Code "and who incurs unreimbursed traveling expenses, including the cost of meals and lodging, while away from home in connection with affairs of the association and at its direction may deduct the amount of such unreimbursed expenses in computing his net income."

However, the amount deducted has to be included in the maximum 20 percent allowed for total gifts.

Safety Codes

Safety codes for moving sidewalks now are being prepared by a committee of the American Standards Association. Helping to compile the code are manufacturers of conveyor equipment, elevators, and rubber products.

It Would Help

The National Society of Professional Engineers, in a booklet, "How to Improve the Utilization of Engineering Manpower," thinks engineers should head consulting engineer firms –

"There are certain types of industries where it is common to have engineers as executives because a knowledge of engineering is required for the capable administration of the company's affairs. Examples of this are the electric light and power companies; elec-

- **York offers the broadest range of capacities in the industry — 18 to 246 tons!**
- **Completely integrated components cut installation costs! Exclusive Flooded Cooler design cuts operating costs!**
- **Exclusive capillary oil return insures trouble-free operation at all load conditions!**

York makes news again – with a series of packaged water chillers designed to cut the costs and simplify the process of air-conditioning. These advanced units lead the field in immediate and long-term benefits both for you and for your clients:

FAST, EFFORTLESS INSTALLATION! The complete system is shipped to you on a single skid. Needs no special foundation. Most sizes can be moved through ordinary doorways. The unit comes complete with insulation, interconnecting piping, and automatic control center. To start up: just charge with refrigerant *by sight*, hook up to power and water supply – and your unit's in business.

LOW-COST, TROUBLE-FREE PERFORMANCE! These features are exclusive with York: *Flooded Coolers* and *positive refrigerant feed control* in all models assure top efficiency and maximum heat transfer over the entire range of load conditions. Positive, *direct oil return* from chiller to compressor completely eliminates the danger of interrupted flow under light loads. Automatic capacity controls save power by continuously adjusting compressor output to prevailing load conditions – without supervision.

SAVINGS IN MAINTENANCE! All components and wearing parts are readily accessible for inspection and maintenance. Tube cleaning of *both* cooler and condenser waterside is greatly simplified because all surfaces are easily reached from either end. And, of course, York's famous Certified Maintenance Service is available anywhere.

Figure for yourself the savings in dollars and man-hours engineered right into this unit. It's another example of York's tradition of designing with the *real cost* of air-conditioning in mind. Consult your classified directory for the name and address of your local York sales representative . . . or write for Bulletin I-213 – which includes simplified specification tables. York Corporation, York, Pennsylvania.

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SUBSIDIARY OF BORG-WARNER CORPORATION
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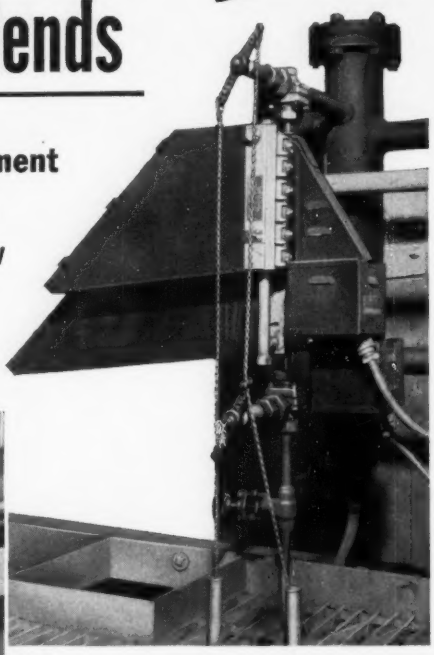
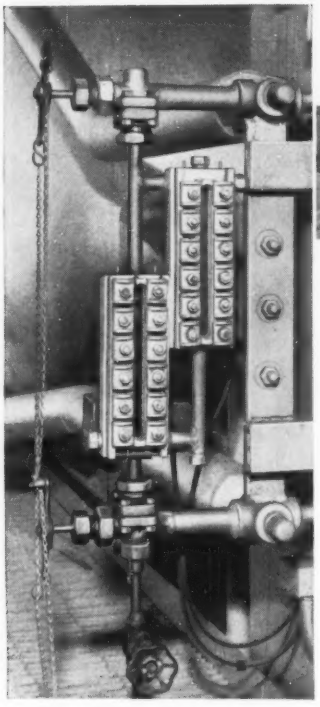
Millions Live Better with York

Boiler Water Level Security Pays Dividends

... Reliance Equipment insures safe, sure supervision for low or high pressure plants





"Two water gages on all boilers operating at over 400 psi" says the code. Here's an example, in the municipal light and power plant of Coffeyville, Kans., illustrating modern Reliance 900 psi equipment.

Water column includes whistle alarm; is equipped with flat glass gage insert, periscope hoods to reflect image through cat-walk opening to a floor-stand mirror below; and mercury lamp illuminator for sharp, brilliant projection. The second gage, also of double-window flat glass construction, is custom-made with tie-bar, for direct-to-drum installation.

Reliance builds for all pressures — brings you a complete line of boiler safety devices. The long record of efficient, dependable service — the extra margin of safety built into all Reliance Equipment — assures long life and low maintenance. Check with your consultants or ask for nearest Reliance Representative address.

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The name that introduced safety water columns.... in 1884

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BOILER SAFETY DEVICES

tronics, aircraft, and chemical manufacturing firms; and in such companies as engineering consultants and construction firms. Here, the engineer is called upon to perform such functions as sales and customer relations of which engineering is an integral part."

Functional Group Gets Secretary-Manager

For the first time, a full-time secretary-manager has been hired by a state functional section level of the National Society of Professional Engineers to further its activities. The Consulting Engineers Section of the Kansas Engineering Society has established a permanent office in Topeka and named Donald P. Schnacke to the post.

Schnacke, who received a B.S. degree in mechanical engineering from Oklahoma State University, in 1951, and an LL.B. degree from Washburn Municipal University of Topeka, Kansas, in 1957, is both a licensed professional engineer in Kansas and an attorney at law, having been admitted to the Kansas Bar in 1957.

The secretary-manager is to promote better relationships between engineers and clients and maintain the quality of professional services offered by consulting engineers.

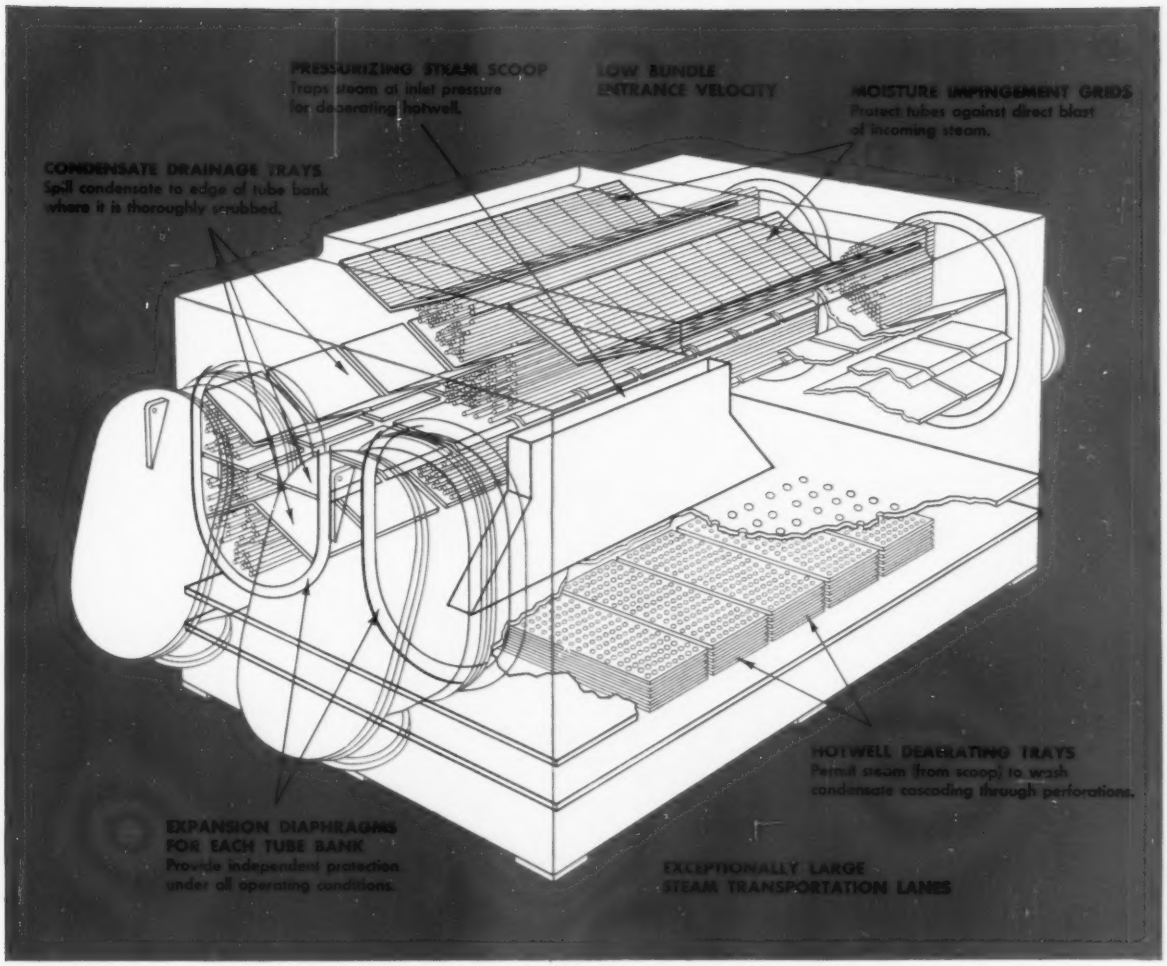
The group includes consulting firms in Kansas, and outside firms doing business in the state.

Liaison With Germany

An American Branch of the German Engineering Society has been established in Detroit.

H. B. Kulose, president of the American branch, said the German society was established in 1856 at Alexisbad in Germany's Harz Mountains, and now has 34,000 members in the Western Zone.

Aim of the American branch is to "establish connections and exchange experiences in the engineering field among engineering societies, technical institutions, and industrial enterprises in the U.S. and Germany." ▲▲


PRESSURIZING STEAM SCOOP
Traps steam at inlet pressure for deaerating hotwell.
LOW BUNDLE ENTRANCE VELOCITY
MOISTURE IMPINGEMENT GRIDS
Protect tubes against direct blast of incoming steam.
CONDENSATE DRAINAGE TRAYS
Spill condensate to edge of tube bank where it is thoroughly scrubbed.
HOTWELL DEAERATING TRAYS
Permit steam (from scoop) to wash condensate cascading through perforations.
EXPANSION DIAPHRAGMS FOR EACH TUBE BANK
Provide independent protection under all operating conditions.
EXCEPTIONALLY LARGE STEAM TRANSPORTATION LANES

Take an inside look at the exclusive "extras" in

ROSS SURFACE CONDENSERS

Nowhere in the industry . . . *nowhere in the world* . . . can you match the extra, exclusive values built into Ross Surface Condensers. The "inside story" is unfolded for you in the 110,000 sq. ft. unit shown here. Study it. Compare it. Draw your own conclusions.

American-Standard*, Ross Heat Exchanger Division has over 40 years' experience in the Surface Condenser field, backgrounded by a string of design "firsts" too long to list here. With a large new plant devoted exclusively to condensers and special heat transfer equipment, Ross is singularly qualified to build the equipment you need . . . any size, any number, for any set of conditions.

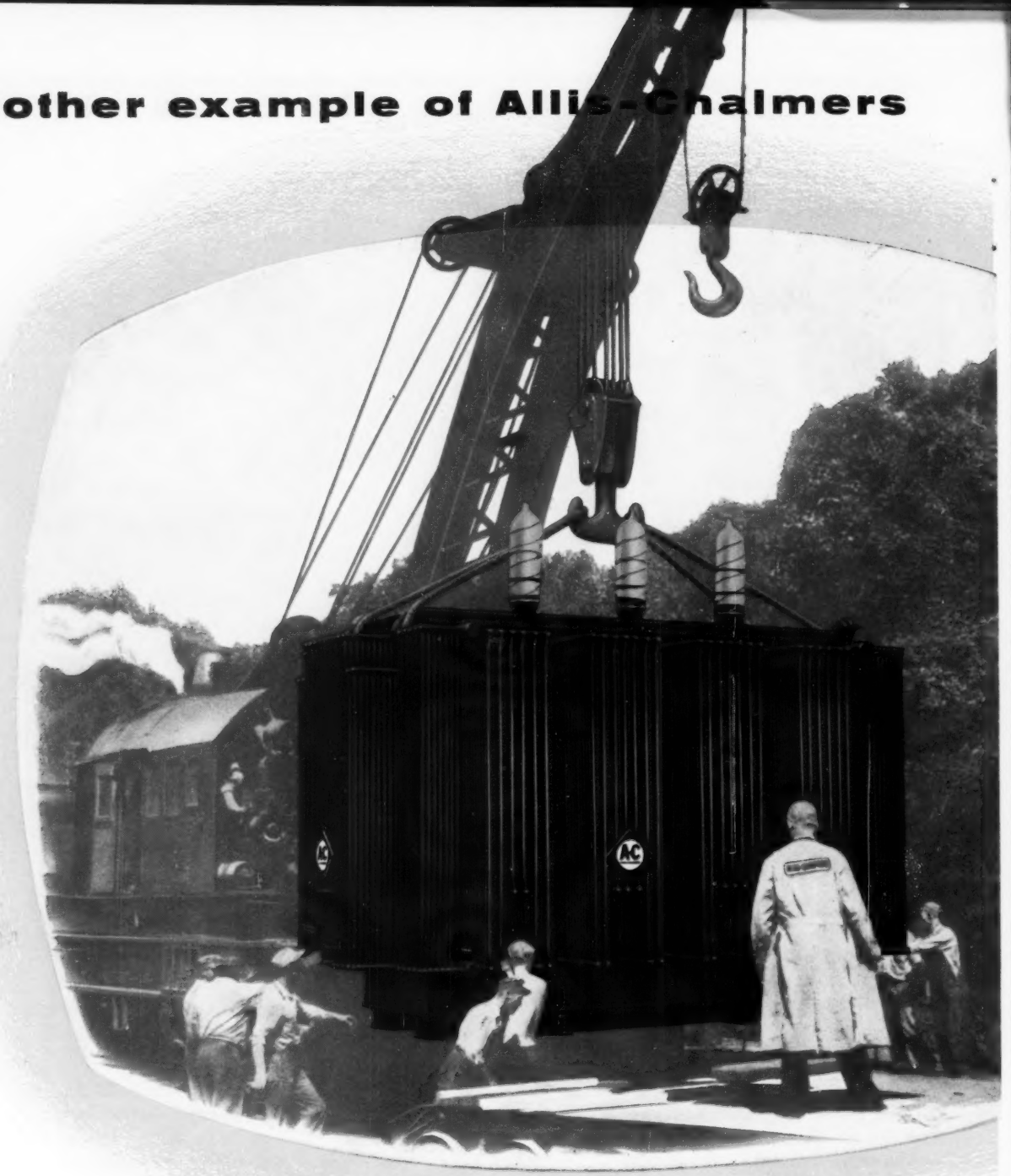
What are your requirements? Your inquiry will bring a nearby Ross engineer to your desk, or if you prefer, Condenser Bulletin 8.2K1 will be mailed with no strings attached.

American-Standard, Ross Heat Exchanger Division, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Station D, Toronto, Ont.

*American-Standard and Standard ℭ are trademarks of American Radiator & Standard Sanitary Corporation.

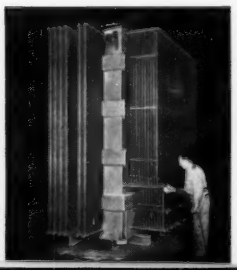
AMERICAN-Standard
ROSS HEAT EXCHANGER DIVISION

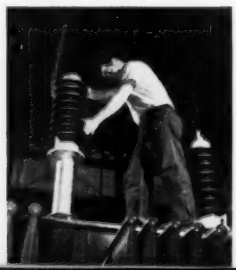
Another example of Allis-Chalmers



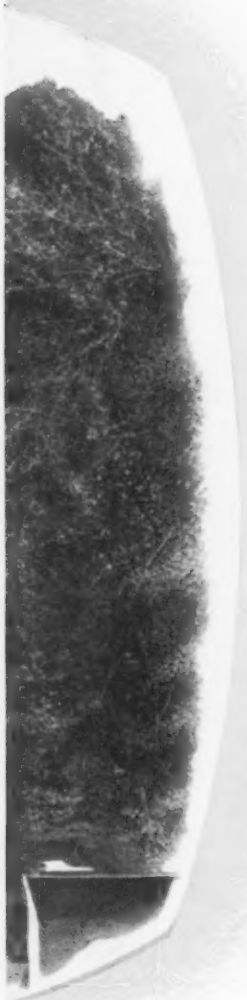
Balanced Design Once an Allis-Chalmers transformer is on the line, you can look forward to years of extra dependable service because *Balanced Design* includes: *Corona-Free* insulation, high impulse strength, uniform cooling, high short-circuit strength, weather-tight construction . . . and many other superior features. Ask your A-C man for all the details, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

Welded-on radiators are pressure-tested at the factory. Bushings are also installed at the factory to reduce installation time.





leadership in transformers



Large factory-assembled transformers moved from train into position and...

on the line in less than 4 hours

A. J. Becker
Field Engineer

"MANY engineers are pleased to learn how quickly large power transformers can be installed. When you check the timesaving features of Allis-Chalmers transformers, the reasons for fast and easy installation become obvious."

Factory assembly where shipping clearances permit is one important reason. Factory-installed radiators and bushings leave nothing to be done at the site except grounding the tank, connecting high and low voltage bushings, and completing system electrical test checks. Building transformers as large as 20,000 kva using this construction has become routine at Allis-Chalmers.

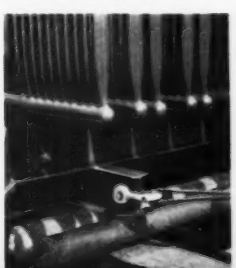
Ski-base helps save time also. It permits rolling or skidding in any direction. Turned-up ski ends ride smoothly on all types of rollers without gouging or digging in. Eyeholes in the corners of the base make winching into position easy. Corner jack lugs are designed with ample clearance, and are clear of cooling tubes.

Another reason behind fast installation is the nation-wide staff of experienced Allis-Chalmers field engineers... like A. J. Becker, with 36 years of experience inspecting, testing and installing A-C transformers. These men *know* transformers. They offer on-the-spot guidance to make installation smooth and quick.

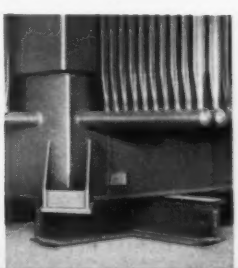
A-C ALLIS-CHALMERS

A-5694

Ski-shaped base of heavy I-beam cross supports permits moving in any direction. Reinforced clevis hole gives extra tow strength.



Ample jacking clearance and working space plus broad, flat surfaces for lifting jacks save hours of installation time.



Report from the West Coast

RALPH S. TORGERSON
Consulting Engineer Correspondent

CONSULTING ENGINEERS in the west played an important part in Engineers Week activities, which this year placed more emphasis on education. Industries have spent large sums of money to attract engineering graduates and also have set up training programs within their own organizations and in cooperation with engineering schools. Generally, consulting engineering firms have felt they could not afford to compete with industry in training recent graduates and students. However, this attitude is beginning to change.

CE exclusive

Many engineering graduates leave college believing that they are qualified engineers in their chosen field. In a paper presented before a recent meeting of the Structural Engineers Association of Southern California, Murray Erick, of Murray Erick Associates, expressed the view that it would be far easier for the employer and the young graduate if the faculties of our universities could make the engineering graduate understand that he has a foundation of scientific knowledge and understanding but that he must serve his apprenticeship by learning how to apply this knowledge to particular programs before he can be accepted as an engineer in the true professional sense. Erick urged the engineering school student to seek work during vacation periods in some field related to his major in school, thereby acquiring skill in and a fundamental understanding of the application of his technical knowledge.

At this meeting Dean Robert E. Vivian, School of Engineering, University of Southern California, pointed to the alarming decline in the enrollment in civil engineering courses. Since World War II enrollment in civil engineering courses has increased only 20 percent while mechanical increased 50 percent and electrical 100 percent. He said that 80 percent of all graduates in civil engineering find employment in governmental agencies, while 80 percent of graduates in other fields of engineering go to private industry.

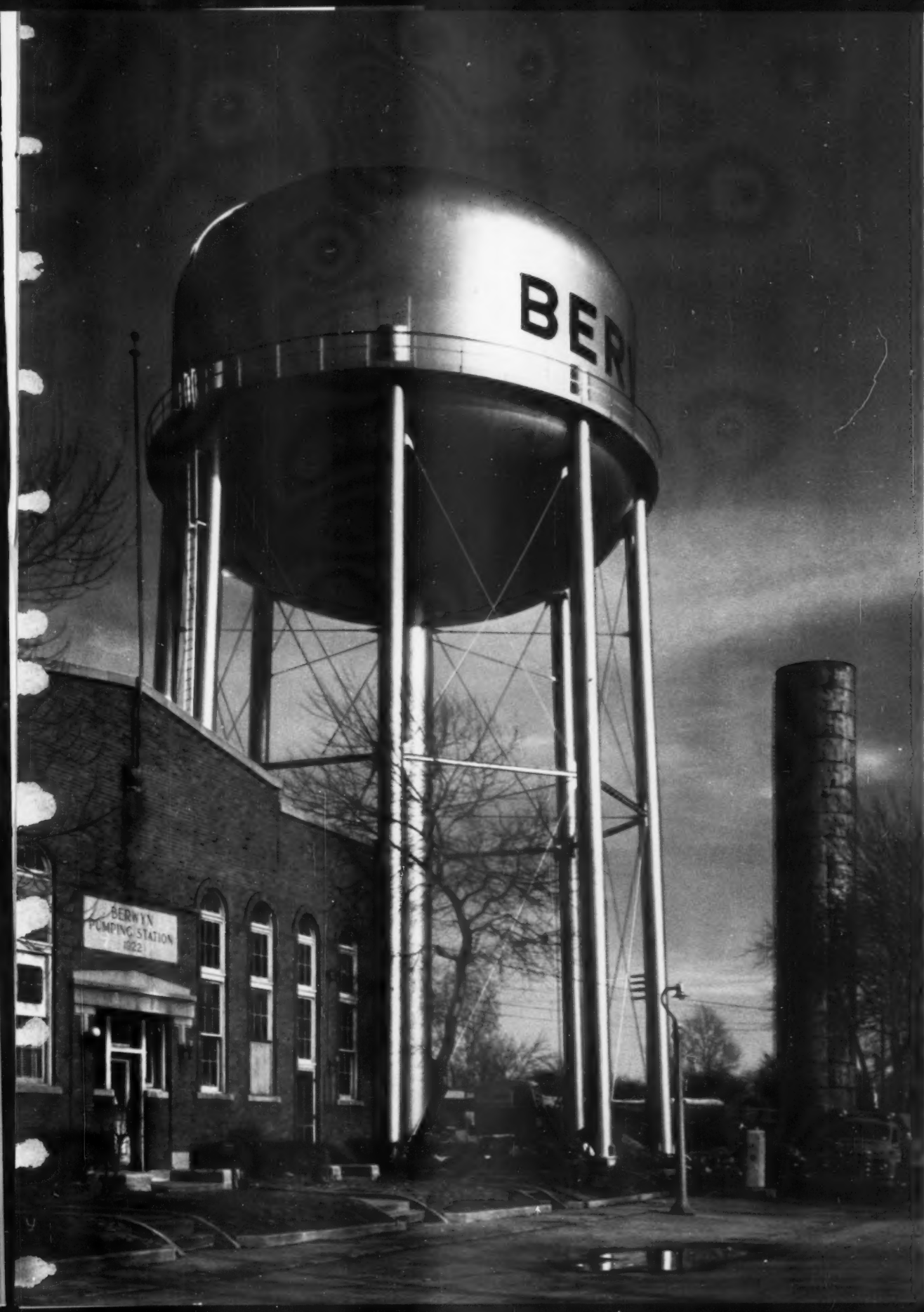
Commenting on the Grinter report (which suggested that two types of engineering courses be made available: one to prepare the more able students for research and teaching; and the other for those less gifted to be educated for the practice of engineering) Vivian said it had been disapproved by both the engineering profession and college faculties.

It also was pointed out that some of the best teachers of engineering have been those who were well grounded in the practical aspects of engineering through training in industry or consultant work before entering the teaching profession.

Professors as Consultants

Charles F. Horne, Convair's vice president and division manager, said the increased demand for scientific education calls for an increase in the number and quality of teachers. "Most teachers," he said, "are forced to supplement their incomes by doing consulting work in addition to their teaching. There is real danger that the consulting work will become the dominant interest and the students suffer accordingly. Salaries must be raised 35 to 45 percent to the point where the best men will be attracted to teaching and steps taken to insure that students receive the full attention of teachers."

Horne stressed the importance of a teacher being able to teach his pupil. "Too much attention," he said, "has been placed in the past on credential



FILE REFERENCE

FACT SHEET

GRAVER®

New Elevated Tank for Modernized Berwyn, Ill. System

William J. Kriz, Mayor
Anton Pav, Commissioner of Public Works
Frank J. Broucek, Superintendent of Water
Edwin Hancock Engineering Company
Consulting Engineers, Chicago, Ill.
George D. Hardin
General Contractor, Chicago, Ill.
Graver Tank & Mfg. Co., Inc.
Design, Fabrication and Erection

Type: Double Ellipsoidal Elevated Tank
Capacity: 500,000 gallons
Height to Overflow: 100′
Head Range: 35′
Diameter of Tank: 52′
Built to AWWA Specifications
Painted, Sterilized and Cathodic Protected

THE PROBLEM

A thirty-six year old water system supplying the City of Berwyn, Ill., a suburb of 55,000 people near Chicago, was inadequate to maintain uniform water pressure throughout the city during peak demand periods. Chicago water flowed directly into Berwyn mains at 20 lbs. pressure and filled a surface reservoir during low demand. Pumps lifted water into two 150,000 gallon elevated tanks and a standpipe, but these were not high enough to maintain sufficient pressure and were used only for storage. City officials asked for the recommendations of a consulting engineering firm.

THE SOLUTION

A complete revamping of the system was recommended: four new pumps, larger piping at the Water Works and direct pumping from the large surface reservoir were part of the solution. In addition, a new 500,000 gallon elevated water tank, riding on the distribution system, replaced the two low 150,000 gallon tanks and the standpipe. There is now sufficient water in elevated storage to supply the system for about 2 hours during slack periods without pumping.

Graver was selected to design, fabricate and erect the new elevated water tank, as well as to remove the old elevated tanks and the standpipe. Cooperation between the Mayor, Commissioner of Public Works, the consulting engineers, the general contractor and Graver made possible the erection of the elevated tank with minimum inconvenience.

Problems of modernizing or building water supply facilities can be readily solved by talking with experienced consulting engineers and Graver. More than a hundred years of experience in tank fabrication and erection enables Graver to contribute strongly to your plans.

GRAVER TANK & MFG. CO., INC.
EAST CHICAGO, INDIANA

New York • Philadelphia • Edge Moor, Delaware
Pittsburgh • Detroit • Chicago • Tulsa • Sand Springs, Oklahoma • Houston • New Orleans • Los Angeles • San Francisco • Fontana, California

BUILDING FOR THE FUTURE ON A CENTURY OF CRAFTSMANSHIP IN STEELS AND ALLOYS

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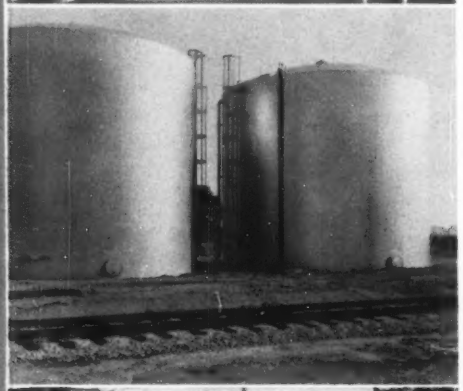
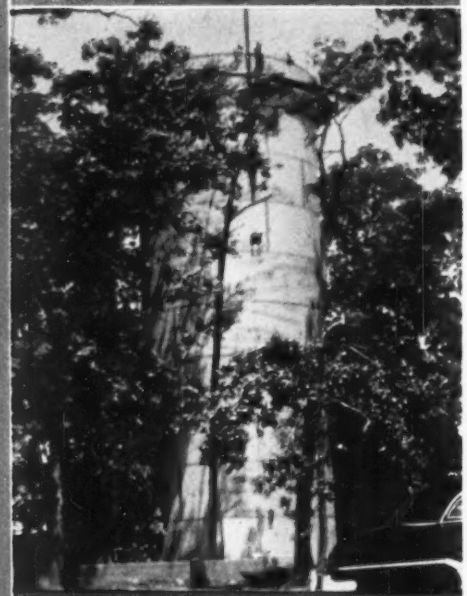




GRAVER®

GRAVER ELEVATED WATER TANKS

Graver elevated water tanks are expertly fabricated from carbon steel, stainless steel or aluminum at Graver plants across the country and are erected on the site by experienced Graver crews to the highest welding standards.

The selection of one of the standard sizes shown in the table offers the advantage of lowest cost and quick deliveries. Should one of the standard sizes not be suitable, special designs by Graver's engineers is a regular service.

Capacity Gallons	Diameter	Head Range	Number of Columns
25,000	18′-0″	13′-9″	4
30,000	18′-0″	16′-6″	4
40,000	20′-0″	17′-10″	4
50,000	22′-0″	19′-0″	4
60,000	24′-0″	19′-0″	4
75,000	26′-0″	21′-0″	4
100,000	28′-0″	23′-9″	4
125,000	30′-0″	25′-9″	4
150,000	32′-0″	27′-11″	4
200,000	36′-0″	29′-11″	5
250,000	40′-0″	29′-2″	6
300,000	44′-0″	30′-0″	6
400,000	50′-0″	30′-0″	8
500,000	55′-0″	30′-0″	8
750,000	65′-0″	35′-0″	8
1,000,000	86′-0″	25′-0″	12
1,500,000	104′-0″	25′-0″	12
2,000,000	112′-0″	30′-0″	16
2,500,000	122′-0″	30′-0″	16
3,000,000	124′-0″	35′-0″	20

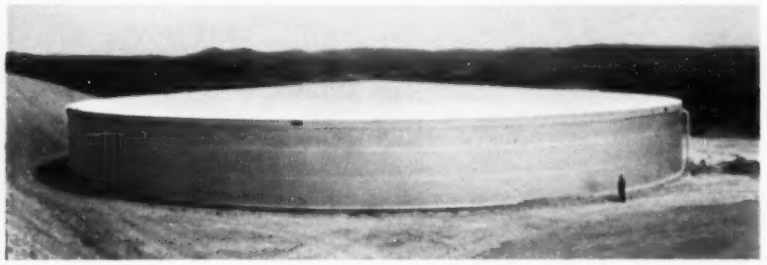
GRAVER PUMP SUCTION TANKS

Graver is an approved fabricator of pump suction tanks under the Factory Mutual Fire Insurance Companies specifications. All standard sizes shown in the table have ¼″ bottoms, 3/16″ self-supporting roofs and shells of thickness such that stress does not exceed 15,000 psi.

Rated Capacity Gallons	Actual Capacity Liquid Depth = Height—6″	Diameter	Height
100,000	100,470	27′0″	23′11½″
150,000	150,120	28′6″	31′11½″
200,000	200,730	33′0″	31′10½″
250,000	250,340	37′0″	31′ 7½″
300,000	300,550	42′0″	29′ 6″

GRAVER STANDPIPES AND RESERVOIRS

Water supply storage tanks whose height exceeds the diameter are referred to as standpipes. When the diameter exceeds the height, they are called reservoirs. Standpipes normally provide static head to the water distribution system; reservoirs usually are intended for storage and reserve supplies. For both types of water tanks, there can be no standard sizes offered. Since the size and form depend upon local conditions and individual requirements, standpipes and reservoirs must be designed in accordance with the special needs of the users and the characteristics of the site.



Building for the Future on 100 Years of Craftsmanship in Steel and Alloys

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA • NEW YORK • PHILADELPHIA • EDGE MOOR, DELAWARE
PITTSBURGH • DETROIT • CHICAGO • TULSA • SAND SPRINGS, OKLAHOMA
HOUSTON • NEW ORLEANS • LOS ANGELES • SAN FRANCISCO • FONTANA, CALIFORNIA

qualifications. We must play down the research aspects of teaching and focus more attention on the lecture hall. Too much accent has been placed on the production of publications by teachers."

The problem of the teacher turning to consulting work to supplement his income has been a source of irritation to the consulting engineering profession. The consultant does not look with favor on the professor who works for a low fee and uses the facilities of his school at little or no cost—often coupled with low price student help. Occasionally professors have been engaged by consulting engineers to gain the benefit of their specialized knowledge, an arrangement which has worked out very satisfactorily.

CEAO Activities

The Consulting Engineers Association of Oregon is cooperating with the legislative committee of the Professional Engineers of Oregon in considering recommendations for revision of the Oregon professional engineers' law. The joint committee has appointed a subcommittee to obtain advice on the proposed revision which has to do with corporate practice. A letter sent to consulting engineers outlined both sides of the question, including excerpts from the proceedings of the National Council of State Board of Engineering Examiners, and a reference to the February 1957 issue of CONSULTING ENGINEER containing the article "We Oppose Corporate Practice." A postcard ballot will be taken.

Basically, the amendments would forbid corporate practice of engineering by engineers in private practice or by architect-engineer firms. All firms would have to be sole ownerships or partnerships.

President Thomas R. Miles of the Oregon Consulting Engineers Association, has appointed Del Collinson to the Association's Fees and Services Committee to represent the product and process en-

ARROW AH HART

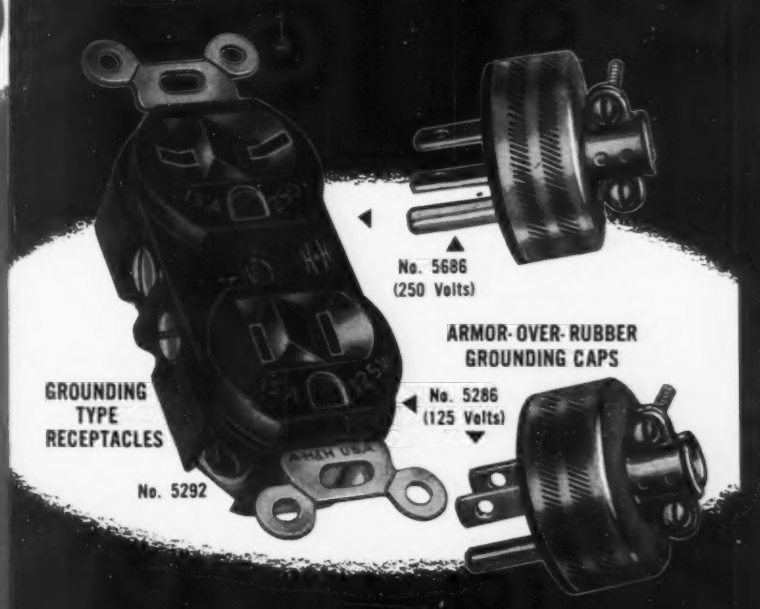
Do Your Plans include "grounding for safety ?"

Mr. Consulting Engineer: There will be portable electrical equipment used in every building — plant, office, school, hospital, etc. — you help plan. Protect this valuable equipment, and those who install, maintain and operate it, by specifying Arrow-Hart H&H specification grade receptacles, connectors and caps that assure proper grounding at all times.

We offer a free 12-page booklet which interprets the National Electrical Code requirements for grounding electricity for portable tools and equipment. Here is everything you need . . . technical information, pictures, diagrams, ratings, and catalog numbers . . . to simplify your specifying job.

Remember—Arrow-Hart's *complete* line of grounding type devices meets *every* safety requirement. Write for Grounding Booklet and our new Consulting Engineer's Specification Index to:

Dept. CE, The Arrow-Hart & Hegeman Electric Co., 103 Hawthorn Street, Hartford 6, Conn.



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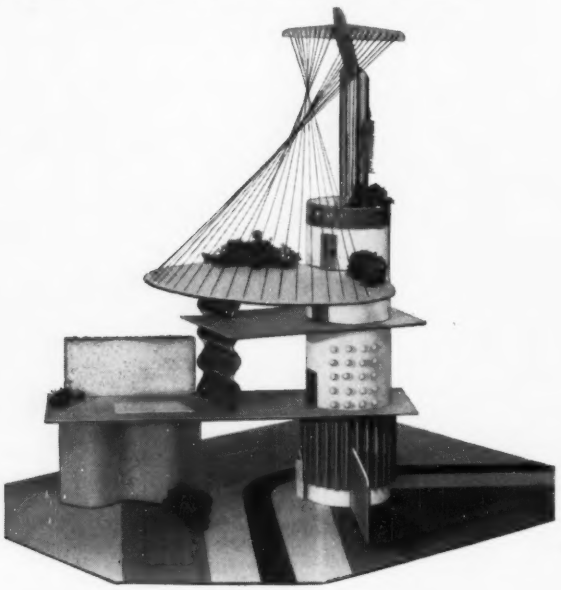
Quality since 1890

MOTOR CONTROLS · ENCLOSED SWITCHES
APPLIANCE SWITCHES · WIRING DEVICES

Consultants Data File . . . one of an interminable series



PERMANENT HOME FOR FLOATING DICE GAME

novel lighting system developed by ingenious engineer

When the Charity Street Cultural and Educational Council decided to build the soaring structure shown above, they called in James Mafia to design an efficient lighting system well adapted to the special needs of the organization.

Throughout the building Mafia used low-hanging lamps suspended from tracks to provide mobile, glare-free light for the Council's evening functions. Because activity is heaviest on weekend evenings, Engineer Mafia wisely chose Heinemann Hydraulic-Magnetic Circuit Breakers for the building's branch circuits. Says Mafia, "Only with Heinemann could I be assured of full current-carrying capacity protection regardless of temperature conditions. Since the Council's game-room discussions often grow quite heated, the use of thermally-actuated circuit protection devices was precluded. I specified Heinemann because only Heinemann Circuit Breakers will hold full, rated current capacity through any ambient temperature range."

Just off the press . . . a new and unexpurgated edition of our famous treatise on foolproof branch circuit protection. If you'll just write for Bulletin 3103, we'll send you a copy as soon as the ink's dry.

S. A. 1429

HEINEMANN

HEINEMANN ELECTRIC COMPANY
127 Plum Street, Trenton 2, N. J.

Circuit breakers

gineers. This committee, which has undertaken a continuing study of fees, has prepared a proposed form of agreement between consulting engineer and owner. After corrections and additions, it will be presented to the members.

Miles has appointed Lowen Thompson as Errors and Omissions Insurance Coordinator, and John Martin has been made a member of the Practices Committee. In the interest of promoting CEAO among possible future members, an invitation to attend the general monthly meetings has been extended to the engineering employees of member firms.

The Oregon association also plans to follow the practice used in California of preparing a special telephone directory listing of consulting engineers. The Public Relations Committee was assigned the task of compiling the data.

The bylaws have been revised to provide that Association representatives in other affiliated organizations shall be appointed by the board of directors from among Association members to facilitate interchange of information.

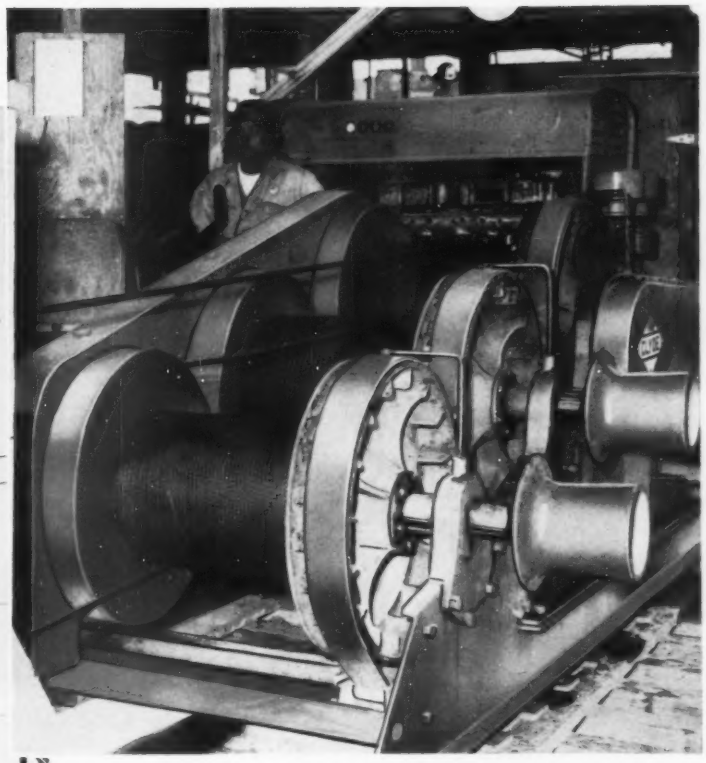
CEC Meeting

The Consulting Engineers Association of California will be host to the second annual meeting of the Consulting Engineers Council, to be held at the Sir Francis Drake hotel, San Francisco, May 1 to 3. Dudley Deane and Robert F. Wildman have been appointed by vice president John Blume to assist Pecos Calahan, executive secretary, in making arrangements and planning a program.

Washington State News

C. M. Barr, the secretary of the Consulting Engineers Association reports that a number of meetings have been held with representatives of the Washington State Highway Department to try to secure some of the work on the Tacoma-Seattle-Everett Freeway for local engineering firms. The

Operator J. L. Cartwright rates this Clyde hoist outstanding in reliability and smooth operation after two continuous years of service on Southland Center project.



Clyde Hoists speed construction on Southland Center in Dallas

In the construction of Dallas' ultra modern Southland Center, progress is the day's main order of business. This block-size development is the site of building projects which will change the skyline of downtown Dallas.

Hub of the development is Southland Insurance Company's 42-story office building, being built by the J. W. Bateson Construction Company. A Clyde 3-drum gasoline-powered hoist is the basic materials-handling equipment credited with lifting a gigantic volume of building materials over the last two years. Cost of repairs and maintenance on the 5-year-old hoist is reported as "almost nil."

On the Southland development, as on building projects the world over, the reliability and smooth operation of Clyde hoists—gasoline, diesel or electric powered—help keep progress on schedule, cut costs and eliminate stoppage in materials-handling. These hoists employ the newest and most thoroughly practical design advantages to assure continuous, high-speed operation and long, trouble-free life . . . advantages that are illustrated and described in special bulletins available upon request.

Check with Clyde. Find out why Clyde hoists are the money-wise choice for your materials-handling problem. Write for your copy of Bulletin 4-M.

Submit your equipment requirements to Clyde engineering specialists for detailed recommendations.

CLYDE RIC

CLYDE IRON WORKS, Inc.

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DULUTH 1, MINNESOTA

HOISTS : DERRICKS : WHIRLEYS : BUILDERS TOWERS
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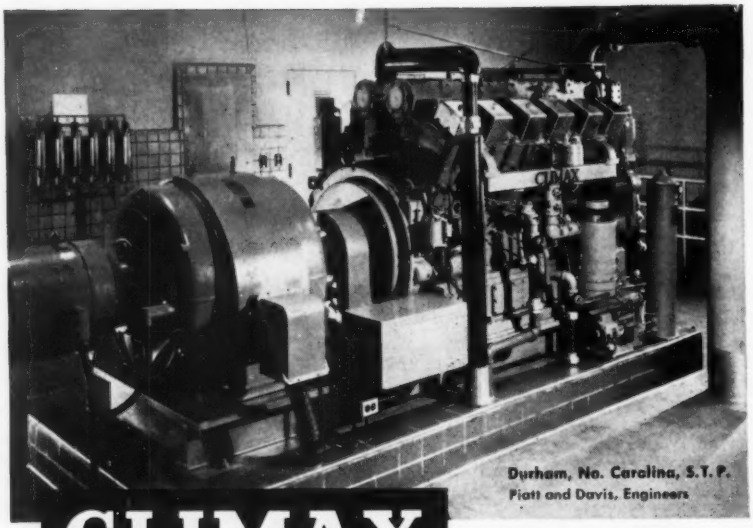

Durham, No. Carolina, S.T.P.
Platt and Davis, Engineers

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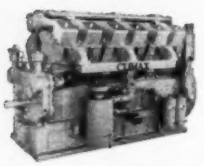
FOR SEWAGE TREATMENT PLANTS...

Climax engines can be found on the job every day of the year in hundreds of sewage treatment plants from coast to coast—powering sewage pumps, blowers and generators. Tremendous savings are being realized by using readily available **sludge gas** for fuel and also by utilizing heat from the jacket water and exhaust gas of the engines to heat digesters and buildings. When a shortage of sludge gas is encountered these engines operate on an auxiliary fuel—either gasoline, butane or natural gas, or a combination thereof. Eight Climax engines are available for continuous duty service in Sewage Plants in a range of sizes from 40 to 300 hp.—for standby service up to 605 hp. max. rating.

Write today for complete information, bulletins or engineering consultation.

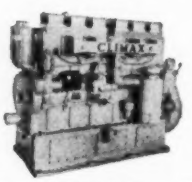


V-125—12 cylinder, 605 max. H.P. at 1200 R.P.M.

V-122—12 cylinder, 520 max. H.P. at 1200 R.P.M.

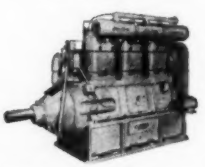
V-85—8 cylinder, 390 max. H.P. at 1200 R.P.M.

V-80—8 cylinder, 340 max. H.P. at 1200 R.P.M.



K-75—6 cylinder, 302 max. H.P. at 1200 R.P.M.

K-67—6 cylinder, 265 max. H.P. at 1200 R.P.M.



R-165—6 cylinder, 192 max. H.P. at 1200 R.P.M.

CLIMAX ENGINE MANUFACTURING CO.
DIVISION OF WAUKESHA MOTOR COMPANY
FACTORY – CLINTON, IOWA

State Highway Department has decided that under the present circumstances they will do all this work with their own forces. The department has been advertising for engineering personnel, and is building up its design staff in Olympia. Officials claim they may have to let part of the work to private engineers if the highway building program is speeded up. All reports from Congress indicate a stepped-up highway program and not a "stretch-out" program as previously planned.

Colorado Legislation

A recent terse legal decision has thrown out the Colorado Architects Registration Statute. In a biting opinion Judge Roscoe Pile of the Jefferson County court ruled the act unconstitutional because it covered too much ground. He pointed out that the key word in the statute – "coordination" – was vague and general, and thus rendered the entire act invalid.

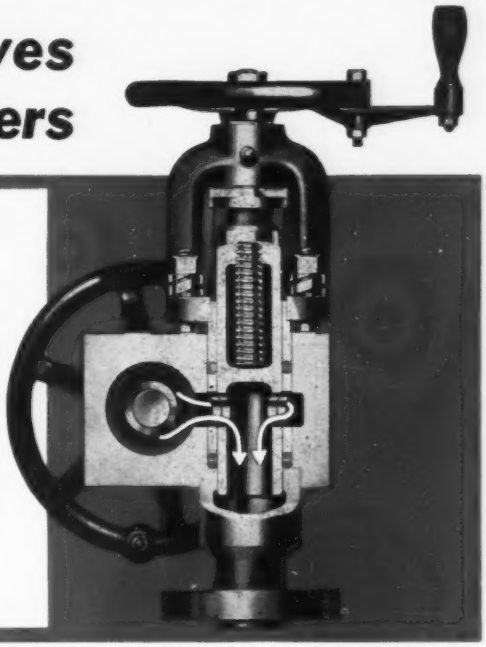
This is the third time Colorado courts have ruled out architects' registration laws. In 1953 and 1954 similar acts were held unconstitutional. To overcome the rulings, Colorado architects suggested an even more restrictive law in 1955. This the State Legislature passed, but with the following proviso:

"Nothing in this act shall be construed to prevent any person from making plans and specifications for or supervising the erection, alteration, or enlargement of buildings."

This amendment in effect gave architects no advantage from registration except the right to call themselves architects, and Judge Pile's decision seems to deprive them even of this. From Judge Pile's opinion, it would appear that anyone now can call himself an architect but his practice must not conflict with the provisions of the statute registering engineers. Some cities, however, have ordinances stating that only architects can get building permits on certain types of plans. ▲▲

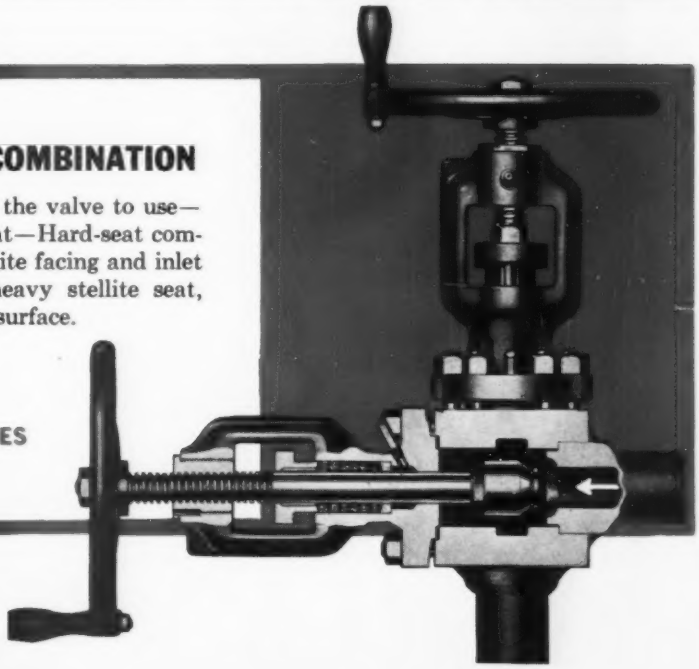
UNIT TANDEM

rugged blow-off valves for high pressure boilers



HARD-SEAT—SEATLESS COMBINATION

■ For boilers up to 1500 psi, this Yarway Unit Tandem Blow-Off Valve offers the maximum in dependable service. A one-piece forged steel block serves as the common body for the Yarway Stellite Hard-seat blowing valve and the Yarway Seatless sealing valve. All interconnecting flanges, bolts and gaskets are eliminated. The Unit Tandem at right is sectioned through Seatless Valve to show balanced sliding plunger in open position and free flow.



HARD-SEAT—HARD-SEAT COMBINATION

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GEORGE W. REYNOLDS
Research Associate
University of Michigan

TORNADOES

And How to Handle Them

George W. Reynolds currently is employed as a research associate at the Willow Run Laboratory of the Engineering Research Institute of the University of Michigan. He also teaches a graduate course in applied climatology in the civil engineering department. Before joining the staff of the University of Michigan, Reynolds served as a research meteorologist and climatologist for the Quartermaster Research and Development Center, Pan American World Airways, and the United States Air Force. He spent eight years as a weather officer with the Air Force and at one time taught a course in climatology and another course in military meteorology at Texas A&M. At Texas A&M he did work on radar identification of tornadoes, and he was an active participant in the 1st and 2nd Texas Tornado Warning Conferences and the 1st Michigan Tornado Warning Conference. He received his B.S. from James Millikin University and his masters from St. Louis University. He is currently at work on his PhD. Reynolds has published a number of papers on tornadoes and weather and is a member of the American Meteorological Society.

TORNADO DAMAGE can be reduced, and this reduction can be effected by reasonable attention to already recommended but often ignored building practices. Some experts have estimated that damage could be reduced by 90 percent. Others are somewhat less optimistic, but most of those who have given the problem much thought agree that the degree of damage depends more on the quality of construction than on the magnitude of the tornado forces. This is, then, one aspect of weather that we can do something about.

CE exclusive

Not all Storms are Tornadoes

Officially, a tornado is described as a very violent, narrow-pathed windstorm. Within this storm there is rotation around a vertical or nearly vertical axis. During the daylight hours this rotation can be seen as a pendant cloud, shaped somewhat like a funnel. Greatly varied funnel shapes have been observed.

By no means all of the storms that have been called tornadoes have been proved to have the classical characteristics. When storms strike at night, neither evidences of rotation nor the funnel clouds can be seen except perhaps in lightning flashes. And no funnel cloud has been observed in many daytime storms described as tornadoes. In fact, the absence of a visible funnel cloud is no reliable assurance that the violent characteristics of a tornado are not present in a storm.

Rotation is not always readily apparent from the damage pattern. Even when a rotating funnel cloud has been observed, the damage usually does not give an obvious indication of rotation. There are several reasons for this. If the funnel axis is at all out of the vertical, the horizontal component of the rotating winds will not form a circular pattern on the ground. Frictional drag might cause the axis at the ground to be almost horizontal. Besides this there is always the movement of the whole storm to be added to the rotation. The resultant vectors might form a pattern that was far from circular.

Varying resistance of objects within the tornado path also affects the damage pattern. The pattern often is so chaotic that one is left with the frustrating feeling that the distribution of forces has been too complex to be understood.

Almost every squall line or thunderstorm will be accompanied by roughly funnel shaped streamers. These often are mistaken for tornado clouds. But it is unlikely that anyone would fail to identify a truly classical type tornado cloud. In other words, squalls frequently may be called tornadoes, but a tornado is not apt to be called a squall.

So we are not at all sure that all of the storms which have been called tornadoes have been true tornadoes in the classical sense. This is important, practically as well as academically, for its affects the assignment of maximum force values.

Tornado Statistics

Tornadoes have occured in all of the 48 states, at all times of the day, and in all months of the year. The most favorable month for tornado formation is May in the upper Midwest and March in the Gulf States. Almost 70 percent of the tornadoes occur between 2 and 9 p.m. This peak period is much more pronounced in the northern states than it is in the warm, moist South.

Between 1916 and 1950 there was an annual average of 149 tornadoes. These killed 227 people per year. This average was boosted considerably by the number of deaths in a few outstanding storms. There were 689 people killed in the Tri-State tornado of March 18, 1925. The Tupelo, Mississippi tornado, of April 6, 1936, killed 216 people. The Gainesville, Georgia tornado of the same year killed 203 people.

It is interesting to compare the annual number of tornado deaths with the more than 500 automobile deaths during the 1957 Thanksgiving weekend.

Since 1950 the number of tornadoes reported has increased rapidly although there is some question as to whether there is a genuine systematic increase in tornado incidence. There were 874 tornadoes reported in 1955. But these 874 storms killed only 125 people. This included the 100 persons killed in the Blackwell, Oklahoma, and Udall, Kansas tornadoes. Only 25 people were killed by the other 872 storms.

The picture was repeated in 1956. Almost 900 tornadoes were reported; less than 100 people died.

Part of the reduction in deaths is the result of the tornado warning efforts of the United States Weather Bureau. Another factor which is obviously important is the exact locations that have been struck. If populated areas are hit, more people are killed. In 1953, three cities (Waco, Texas; Flint, Michigan; and Worcester, Massachusetts) were struck, killing more than 300 people. The same storms might have struck only a few miles away and killed no one.

As the population of the nation increases, the average number of people within a tornado path also will increase, whether the number of tornadoes

Dallas tornado (April 1957) showed comparatively light damage on left side of tornado path (left), yet total destruction toward right side (above).

does or not. And the trend toward lightweight, economy housing, some of which is not very tornado resistant, may contribute to a greater damage casualty record.

The Nature of Tornado Forces

There are two kinds of tornado forces. These are the forces of motion and the forces resulting directly from an air pressure gradient. The forces of motion are those resulting directly from the winds. These winds exert both positive and negative pressures on the outside of a building. The negative as well as the positive pressures are significant, especially on the roof and around the walls.

The pressure gradient force is caused by the low pressure in the tornado center. This low center sometimes approaches so rapidly that some buildings are unable to lose air fast enough to permit a compensating pressure drop on the inside of the building. The pressure gradient force generally is credited with causing explosive tornado damage.

Popular Estimates of Wind Speeds

The most commonly used newspaper description of tornado wind speeds is "300 to 700 miles per hour." These figures presumably are official – from the United States Weather Bureau. The *Weather Glossary*, a Weather Bureau publication, refers to winds "as high as, or in many instances higher than 300 miles per hour." *Tornado Occurrences in the United States*, another Weather Bureau publication, says that tornado wind speeds "have been estimated to exceed 500 mph."

The public has grown to accept the 300 to 700 mph concept. With it has come an unjustified tornado fatalism. "Tornado forces cannot be successfully resisted, so why try?" The assumption is that speeds of this terrifying magnitude exist all across the tornado path of destruction.

During an investigation of the Wood River, Illinois tornado of May 21, 1949, a man was asked whether or not his house was bolted to the foundation. His reply was, "What's the difference whether it was or not? If a 400 mile an hour wind comes along, it's going to blow away anyway." He was right, of course. But his house had not been anchored, and there was reason to believe that the winds were not that strong.

Many weathermen still cling to the 300 to 700 mph tenet – but with diminishing tenacity. Most texts report these high speeds, but there is no special text on tornadoes, and it is a common practice for the author of a general text to obtain his information from another text. Mistaken ideas can be perpetuated.

Damage Indicates Wind Speeds

The belief in these high wind speeds may be the natural outcome of the extreme awesomeness of tornado damage and the suddeness with which it occurs. A section of town that one has traveled through for years becomes a mass of overgrown splinters in less than a minute. In the past only a few tree limbs had been broken with recorded winds of 65 or 70 mph, but now the damage is complete. So it is assumed that the destroying winds must have been several times 70 mph.

On the other hand, a final addition to a stack of blocks can reduce an orderly arrangement to a shambles. Once the stresses surpass, even by a little, the critical resisting strength of a structure, a fracture may develop. Thus, a small excess of wind

This 2x4, carelessly bolted to the foundation, was the baseplate for a Dallas apartment. Unless a house is well anchored, bolting does little good.

stress over the critical limit can result in a completely destroyed building.

Estimates of tornado wind speeds can be based on damage surveys. Wind pressure on a building is believed to be proportional to the square of the velocity, $P = K(CV^2)$. The proportionality constant, K, varies with the size and shape of the resisting body and the angle at which the wind strikes it. The effective horizontal pressure on a structure, resulting directly from the wind, can be up to one and one-half times as great as the pressure that would result from the same wind striking perpendicularly on a flat plate of infinite extent.*

*J. W. Howe, University of Iowa Hydraulics Laboratory, discusses the complex of wind forces on a building in *Civil Engineering*, May 1952, p330-334.

This direct pressure on a flat plate, $\overline{VP} = CV^2$, often is called the velocity pressure and is of the following magnitudes.

Wind Speed (mph)	Pressure (lbs/ft²)
100	30
150	70
200	120
300	270
400	500
500	750
600	1100
700	1500

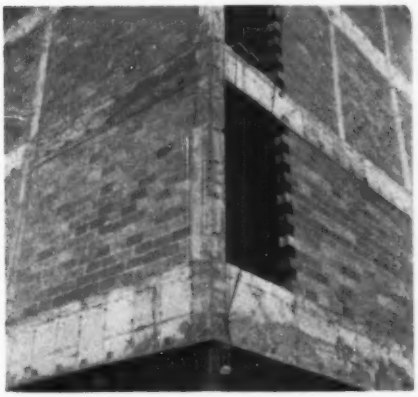
If a structure has been destroyed, we know that the forces were at least strong enough to destroy it. If a structure has not been destroyed, we know that its critical limits were not exceeded. Thus, by studying the pattern of destroyed and undestroyed buildings, an estimate of the order of magnitude of the maximum forces can be made.

Reasons for Lowering Estimates

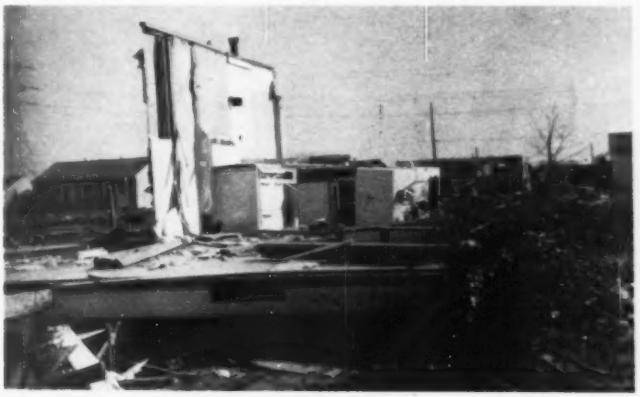
The United States Weather Bureau recently has sponsored a number of tornado damage surveys. These surveys were carried out by teams at Texas A&M and Oklahoma A&M colleges and by the Weather Bureau Severe Storms Unit, of Kansas City. The results indicated that the maximum wind speeds throughout the tornado damage paths were generally on the order of 125 to 150 mph. These results are compatible with those obtained during my investigation of the damage from 12 tornadoes.

Calculations indicate that wind speeds under 100 mph could overturn an unloaded box car. Winds under 200 mph could blow over a loaded box car. Both have happened.

Although the exact speeds necessary to blow over trees cannot be computed, a 100-mph wind imposes a tremendous overturning moment on a tree. The



Steel in Bryan, Texas courthouse withstood the stresses while bricks fell.



Secured to buried pipes, plumbing fixtures and gas appliances usually survive tornadoes, as the ruins of a Dallas home show.

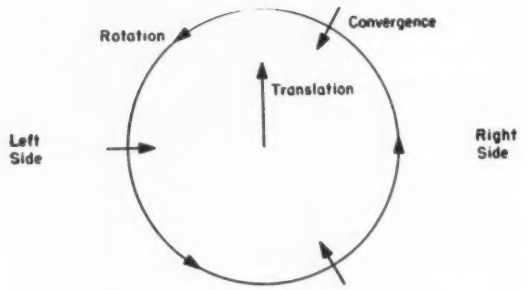


Fig. 1 – Component air motions of tornadoes.

foliage, the chief resisting element, is at the end of a considerable lever arm.

There have been some indications of isolated occurrences of wind speeds well over 150 mph. An "eye witness" reported that a box car was tipped up on end in the Dallas tornado of April 2, 1957. This report may or may not be true. A Texas A&M engineer found that wind speeds on the order of 200-250 mph would be necessary for this.

After the Worcester, Massachusetts storm of June 9, 1953, one investigator estimated that wind speeds in excess of 300 mph were necessary to blow over some towers. Another investigator estimated that these towers could have been overturned by winds of 200 to 300 mph.

The assumptions necessary in making these estimates limit the validity of the results. It is certain, however, that the winds in this storm were especially severe, and maximum winds might well have exceeded 150 mph. But this should not be distorted into an assumption that all of the winds across the path were so extreme.

These isolated instances of extreme values, even if they are accurate, apparently are not representative of the maximum forces generally experienced over the tornado path. Without disputing the validity of claims of the absolute maximum forces, it is still true that far fewer structures would be destroyed if they could successfully resist wind speeds of 150 mph. This represents a pressure of 70 pounds per square foot.

Other Factors

There is still another factor which indicates a rather low value of maximum velocity. In a classical type tornado, the horizontal wind velocity is the resultant of the three component air motions shown in Fig. 1. There is motion toward the center, called convergence; motion around the center, called rotation; and motion of the center itself, called translation.

While it is not necessarily valid, assume convergence to be negligible. Then assume that the air is moving counterclockwise around the center. The speed on the left side, then, is less than the speed on the right side by twice the speed of translation. The average speed of tornado translation is 40 mph. With this translational velocity and rotation speeds of 110, 160, and 260 mph, vector addition gives the results shown in Fig. 2. This indicates a considerable variation in wind speed depending upon where across the path you measure the velocity.

During my tornado investigation I noticed that, with isolated exceptions, the debris in the damage path moved in the direction of translation. In some of these storms the damage built up rapidly from right to left, reached an extreme maximum, and

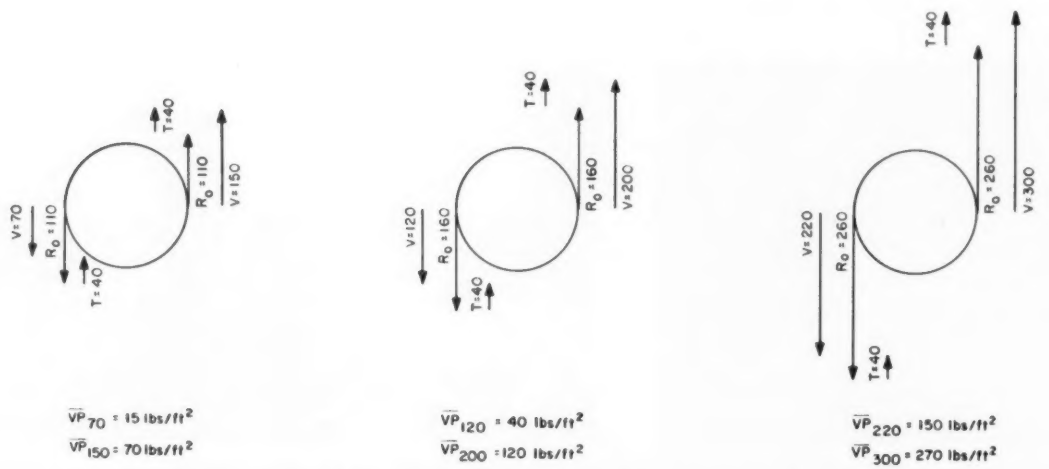


Fig. 2 – Vector diagrams of three tornadoes. Note the wide variations in the velocity pressures.

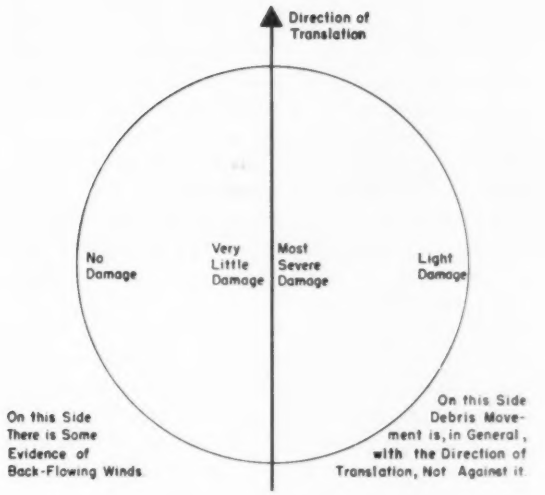

Direction of Translation
No Damage
Very Little Damage
Most Severe Damage
Light Damage
On this Side There is Some Evidence of Back-Flowing Winds
On this Side Debris Movement is, in General, with the Direction of Translation, Not Against it

Fig. 3 – Left. Diagram shows that the damage path is located within right half of tornado path.

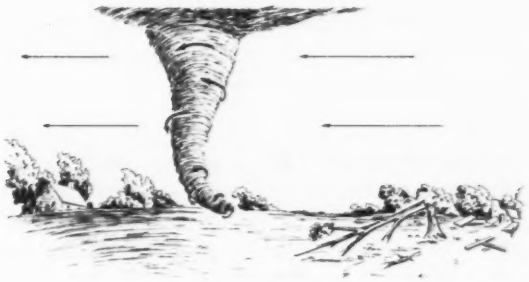


Fig. 4 – Above. "Dragging tail" tornadoes have a marked vertical component in the rotary winds.

then very quickly dropped off to nothing. As shown in Fig. 3, the serious damage path represented only the right half of the tornado path. The most extreme damage, on the left edge of this damage path, actually occurred along a line believed to be just to the right of the center of the tornado path.

One interpretation of the observed phenomenon could be that the winds on the left side of the tornado were too weak to cause destruction. Here, although the net force was still in the direction of rotation, reduction in speed by twice the speed of translation had reduced the wind velocity to below the critical value. However, an examination of Fig. 2 will show that the relatively low velocity of translation could not have this pronounced effect if maximum speeds were much over 200 mph.

Similar damage path characteristics have been reported in the literature. They were observed after the Kansas City storm of 1957. They generally held true for the Dallas tornado. An investigator of the recent Murphysboro, Illinois tornado noted that a destroyed house on the left side of the damage path was translated *with* the storm, again in-

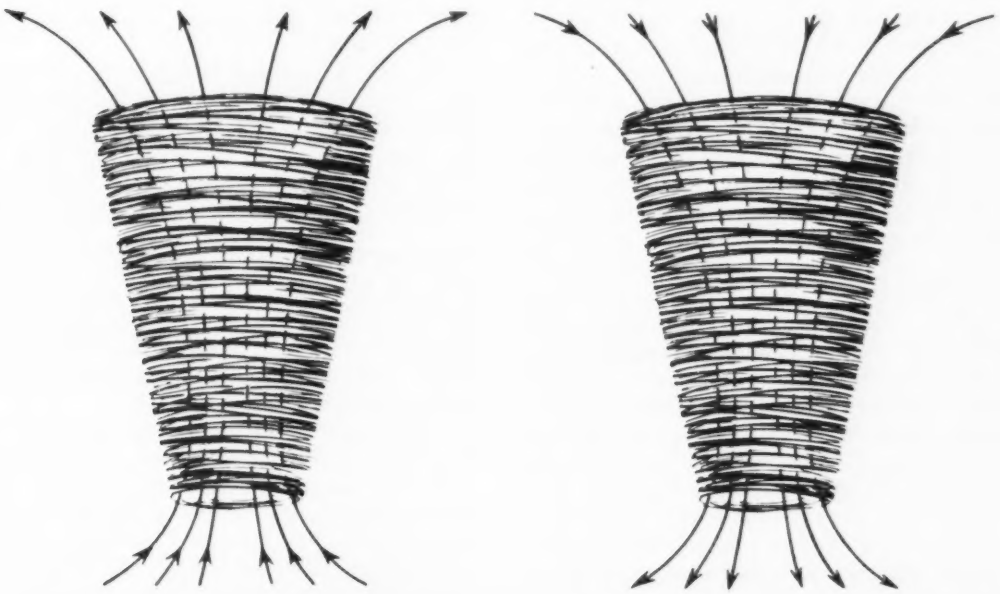


Fig. 5 – Left; classical is generally accepted type tornado. Right; Rossman type is controversial.

dicating that the left edge of the damage path is to the right of the center of the tornado path.

Vertical Wind Forces

We have been discussing only the horizontal wind components. If the axis is tilted sufficiently, the rotational winds would have a marked vertical component, as illustrated in Fig. 4. The tilting of the axis can be to the side or it can be the result of a hanging back of the lower part of the stem. This could be brought about by frictional drag.

Added to or subtracted from these vertical forces that result from tipping are the air movements, inward and upward around the tornado center. Another concept, which is not yet accepted, generally has the air rushing downward in the core with divergence at its base. Some investigators say that both kinds of tornadoes occur. (See Fig. 5.)

Whatever these vertical winds may be, they have been reported to have done many miraculous things. One of the most spectacular reports is the story of the steam engine that was lifted, turned around, and set back on a parallel track, facing in the opposite direction.

Persons being picked up and carried away have been reported a number of times. Some have been killed, some have been uninjured.

Flora, in his book *Tornadoes of the United States,* tells a story about the Ponca City, Oklahoma storm of April 25, 1912. "The whirling cloud picked up a house in which a man and his wife were eating supper and carried it aloft. The house literally exploded in the air, but the floor remained intact and settled horizontal to the ground, depositing the two people, uninjured."

No one knows just how strong these vertical winds are, but they are no doubt significant. Guesses on the order of 100 mph are common. It is suspected that houses have been lifted by the static pressure gradient force and then blown away by the winds. Actually, an airfoil effect then could continue to lift the building without much of a vertical wind component.

Static Pressure Force

It usually is accepted that there is an intense low pressure in the center of a tornado. In addition the wind creates pockets of low pressure around a building. There have been estimates that the pressure reduction in a tornado is perhaps as much as ½ an atmosphere. On the other hand, officially measured pressure drops have all been less than 1/30 of an atmosphere. This is a drop of less than an inch of mercury. If no air were lost from a building, a one inch drop outside would result in an outward push of about 70 pounds per square foot. Since the thrust may have to pull only a few nails in order to push a wall outward, 70 pounds per square foot could be serious. Attention to more secure cornering through additional bracing, perhaps with commercially available cornering devices, might very well permit a building to survive.

A one-story house in the North weighs on the order of 75 pounds per square foot of floor space, so a drop of one inch of mercury may be enough to lift an unanchored house from its foundation. This, of course, puts it more at the mercy of the wind. Since the drop caused by the pressure gradient would be augumented by the negative forces resulting from the wind, a pressure gradient drop of less than one inch should be sufficient to lift an unanchored one-story residence or warehouse.

If a tornado is moving at the rate of 40 mph, and if there is a pressure drop of one inch of mercury in 120 feet, the air will have to escape at the rate of 11 mph if there is an effective venting area of one square foot per 1000 cubic feet of air space. This would offer complete compensation. It is suspected that few of the buildings within a tornado path experience a pressure gradient as great as this. And complete compensation is not necessary.

Roofs are particularly susceptible to this static pressure gradient force as well as to the dynamic pressure reductions caused by the wind flow. A roof-ceiling unit weighs 15 pounds or less per square foot of projected area. Thus a pressure drop sure of 0.2 inch lifts an unachored roof-ceiling unit.

When the roof is separate from the ceiling it weighs on the order of 7.5 pounds per square foot of projected area. An uncompensated drop of 0.1 inch of mercury would lift such an unanchored roof. This gives the winds a much better chance to sail it away.

The roof is important to the strength of a building. It helps to hold it together. After the roof is gone the building still resists compression but it has little resistance to expansion. The winds need not be at all fantastic to finish the job, and the walls could be laid outward as if the building exploded.

How Can the Damage Be Reduced?

It would be presumptuous for a meteorologist to tell an engineer how to build a structure. However, here are some observations of past structural behavior which may be useful indications of desirable building procedures.

No instances have been found in which rigid framed, steel reinforced concrete buildings have suffered structural damage during a tornado. These structures have been known to successfully resist tornado forces. For example, the Roosevelt Hotel and the City Hall stood in the midst of very severe damage during the Waco tornado of May 11, 1953. The Gordon Hotel was not seriously damaged dur-

ing the Albany, Georgia tornado of February 10, 1940. The buildings around it were completely demolished. It has been reported that a steel water storage tank successfully resisted the Kansas City tornado of last May 20.

Load bearing brick wall structures seem to succumb easily to tornado forces. The five-story Dennis building, destroyed in the Waco tornado of May 11, 1953, is an example. This furniture store, with a large (but empty) water tank on the roof, collapsed completely, killing 29 people.

Crushing by falling walls, ceilings, and roofs account for a large fraction of tornado deaths and injuries in public and commercial buildings, such as furniture stores, warehouses, theaters . . . The collapse of these buildings inward is made easier by the relatively long distance between interior walls.

Steel framed buildings, with a nonload bearing concrete block or brick wall laid within the framework, may lose blocks or bricks during a tornado, but the framework and most of the structure probably would remain. The photograph of the Bryan, Texas courthouse illustrates this type of building.

During the investigation of 12 tornadoes only two frame buildings anchored to solid foundations were found destroyed. These two were anchored only by 2 x 4's (or 2 x 3's) with the bolts carelessly placed near the edges of the base plates. This is not as good an indicator as it might be, however, for amazingly few houses are bolted.

During the investigation of the Wood River tornado, out of 16 houses judged to be in equally bad portions of the path, 5 were anchored and 11 were not. None of the 11 was repairable. But 4 out of the 5 that were anchored were relatively undamaged. The other had a corner knocked off by flying debris.

Many buildings are like boxes. They resist compression but are highly susceptible to expansion. Fastening the corners together by iron straps should be far more effective than toe-nailing.

The roof helps to hold the building together. If it goes, the building is likely to follow, so anchoring a roof to the rest of the structure makes it less likely to be blown away. This is not a new concept. The Factory Mutual Insurance Company has been advocating roof anchorage of commercial buildings for years. A board of engineers investigating the Tri-State tornado of 1925, the tornado with the worst death toll of the 20th century, reported that improper anchorage was a prime cause of damage.

If only part of a building remains, it is likely to be the part around the plumbing.

Jalousied windows, and exhaust fans make good built-in vents. (In homes, fireplaces also are helpful.) If additional venting is considered desirable, some pop-out vent, or an unbalanced window could be included in the design. Windows that open inward near the bottom are excellent relief valves, yet the room is protected from the rain.

Whether or not special venting should be undertaken, and how it should be done, is basically an engineering decision, but some sort of solution should be found. It is suspected that automatic venting might have saved the Dennis Building and the 29 people in it. As a matter of fact, venting may be the only way to increase the tornado resistance of old structures with load bearing walls.

Concrete block buildings do not appear to be very tornado resistant, but this may not be true for all designs.

Many modern public buildings, such as schools, churches, and libraries, have outside walls which are mostly of glass. This glass offers little protection from flying debris. As a matter of fact, the flying pieces of glass themselves become deadly missiles.

An area which is protected from the flying glass, as well as the flying debris, should be provided. This area should be resistant to collapse inward. Further, school authorities should be informed as to which areas are the strongest and afford the most protection. Not only could this save lives and reduce injuries, but it would help alleviate the panic that often exists during tornado forecast periods.

Better Construction Means Less Damage

In summary it is believed that if a structure is fastened to the ground, reasonably tied together, with the roof tied to the frame, and perhaps has some venting device, it should successfully resist most, if not all, tornado forces. Although destructive tornadoes are not as likely as we are inclined to feel, no one wants to become a statistic. And tornadoes cost individuals and insurance companies an average of $14 million a year between 1916 and 1950. With the increased valuation of property and industrial and domestic expansion, this figure is bound to increase rapidly unless some of the weaknesses of past building practices are corrected.

Here is a quote from personal correspondence with a civil engineer, emphasizing the need for better structural design and improved building codes:

"Most tornado damage is accounted for by homes and older type commercial buildings. Such buildings are commonly built by practical builders without benefit of structural design. Many are designed by architects who often leave the details of fastening to the builder. It would be relatively easy to write into building codes certain basic requirements for anchoring to foundations and for fastening unit to unit to achieve greater tornado resistance." ▲▲

The author would like to express his thanks to Dr. Leo M. Legatski, Professor of Civil Engineering, Univ. of Michigan, for his helpful suggestions concerning parts of this article.

S. LOGAN KERR
Consulting Engineer

S. Logan Kerr, a consulting engineer in Flourtown, Pa., is internationally known for his contributions to hydraulics. He is the author of many technical articles and portions of two handbooks. He was graduated from the University of Pennsylvania, in 1921, and opened his own private practice in 1945. Acting as a "consultant to the consultants" he has advised on the design of many long pipelines and pumping stations, particularly with respect to their hydraulic and surge characteristics. He has been chairman of a number of national committees of ASME, and he is a Fellow member of that society. He is an honorary member of the American Water Works Association, a member of ASCE, the American Ordnance Association, the Engineering Institute of Canada, and the Institution of Mechanical Engineers, London. He has three times been chief delegate from the U. S. to meetings of the International Electrotechnical Commission.

Water Hammer... A Problem in Engineering Design

CE exclusive

ONE SURE WAY to start a lively discussion at a technical meeting is to ask, "What should a consulting engineer do about water hammer?" The technical phases of water hammer seem to be taboo. Undergraduate courses at engineering schools have not given the subject too much attention. Textbooks on hydraulics seldom devote more than a few pages to the subject. A general treatment does not seem to be available at the undergraduate level. Recent handbooks have greatly improved their sections on water hammer, but unfortunately they still emphasize involved theory and concentrate on hydroelectric plant problems.

Two books on water hammer have been published in recent years (1951 and 1955) but they are based on advanced graduate course lectures and dwell on theory and complex problems. Journals of the national engineering societies, such as ASME and ASCE, have a wealth of information on the subject, but here again the greater part pertains to hydroelectric plants. A few more recent papers in the *Journal* AWWA, it is true, have directed attention to practical aspects, and more such articles would be welcome.

Water hammer problems are encountered in many types of installations:

¶ In hydroelectric projects they are present in normal plant operations. The investments involved in equipment and penstocks are large, safety and reliability are of great importance, and detailed economic studies dealing with water hammer can be justified. Most engineering organizations that design hydroelectric plants have staff members familiar with the problem or have access to specialists in the field.

¶ In large water supply projects with long pipelines or pumping plants of large capacity, the economics of design and reliability of operation usually require some consideration of water hammer and

pressure surges. Crude oil and petroleum products pipelines can be included in this category.

¶ In the smaller water supply installations – for sewage, for industrial processes, and even for many steam-electric generating stations – little or no attention seems to have been given.

The first category appears to be well taken care of, so the attention of consulting engineers should be directed to the second and third groups.

Position of the Consulting Engineer

The consulting engineer must recognize his obligation to seek a safe and economical solution to water hammer problems. He should understand also that the best time to cure water hammer troubles is in the design of a project, before it is constructed and placed in service. It is far better to prevent failures resulting from surge than to repair breaks and apply corrective measures later.

Because the consulting engineer assumes full responsibility for the safety, reliability, and proper operation of his designs the basic decisions must be his. He must consider these factors:

¶ Will there be a water hammer problem present, and if so, how serious will it be?

¶ Will it be great enough to develop pressures beyond the normal working pressures of the conduits based on expected static conditions or hydraulic gradients under maximum flow?

¶ Will the surges be of sufficient magnitude to require increases in strength of the conduits beyond the normal hydraulic gradient design?

¶ What operating conditions could result in excessive water hammer?

¶ How can the expected surge pressures be predicted, prevented, or controlled?

The designing engineer then must decide if he knows enough about water hammer to solve the design problems. If he does not have sufficient knowledge, how does he acquire it?

The most desirable procedure is to learn what he needs to know about water hammer himself or get the information within his own organization. Then he or his associates can predict surges on the basis of the operating program of the project.

Once having this information available, analyses can be made for the proper selection of equipment, the use of remedial devices, the settings of valve stroke timing to hold pressures to safe limits, or by the provision of added strength to the conduits. His organization then can produce specifications for equipment which will guard against water hammer or limit it to safe values.

Water hammer problems are not encountered on all installations or at least do not assume sufficient proportions to affect the safety of equipment. Thus there may not be justification, in many organizations, to have a staff member or principal who is a "water hammer expert."

The Manufacturer

The easiest path for the consulting engineer to follow, and unfortunately one that has been followed all too frequently, is to depend upon the equipment manufacturer to solve his surge problems for him. The manufacturer is anxious to sell his equipment and the controversial question of "free engineering" immediately arises. Information provided by a manufacturer is no more unbiased when given to an engineer than when given directly to a client. The cost of a surge analysis may be substantially more than the cost of valves or other devices offered by manufacturers as a cure for water hammer problems. Whether this cost can or should be included in the price of the equipment is always a matter for debate.

The advice of manufacturers on the performance of their equipment is always desirable, but the consulting engineer must, of his own knowledge and experience, be able to evaluate this information in relation to his own design requirements. We all know only too well "the siren song of the salesman" but, after all, he is only doing his job in putting his wares where they shine to best advantage.

With surge control equipment it is essential to evaluate the effectiveness, the suitability, and the correctness of application of various equipment to the particular problem involved. This is obviously an engineering problem, and is up to the consulting engineer to solve it.

The Outside Expert

Another solution may be the use of an outside consultant who has specialized knowledge of water hammer and surge problems. By securing an independent opinion based on a detailed analysis and computation of surges, the proper equipment can be recommended to the consulting engineer designing the project. This allows him to prepare specifications in the same manner he would if he had the specialized knowledge in his own firm.

The manufacturer would be called on to submit information concerning his products, but this would be evaluated on a professional basis to make sure that it is suitable for the service, that it can be depended upon to function as required, and that its cost is justified.

Where consulting engineers use the services of an outside specialist in water hammer problems, the cost should be passed on to the client as a reimbursable expense. But where such arrangements have not been made, there is often reluctance on the part of some consulting engineers to use outside assistance. The situation should be faced,

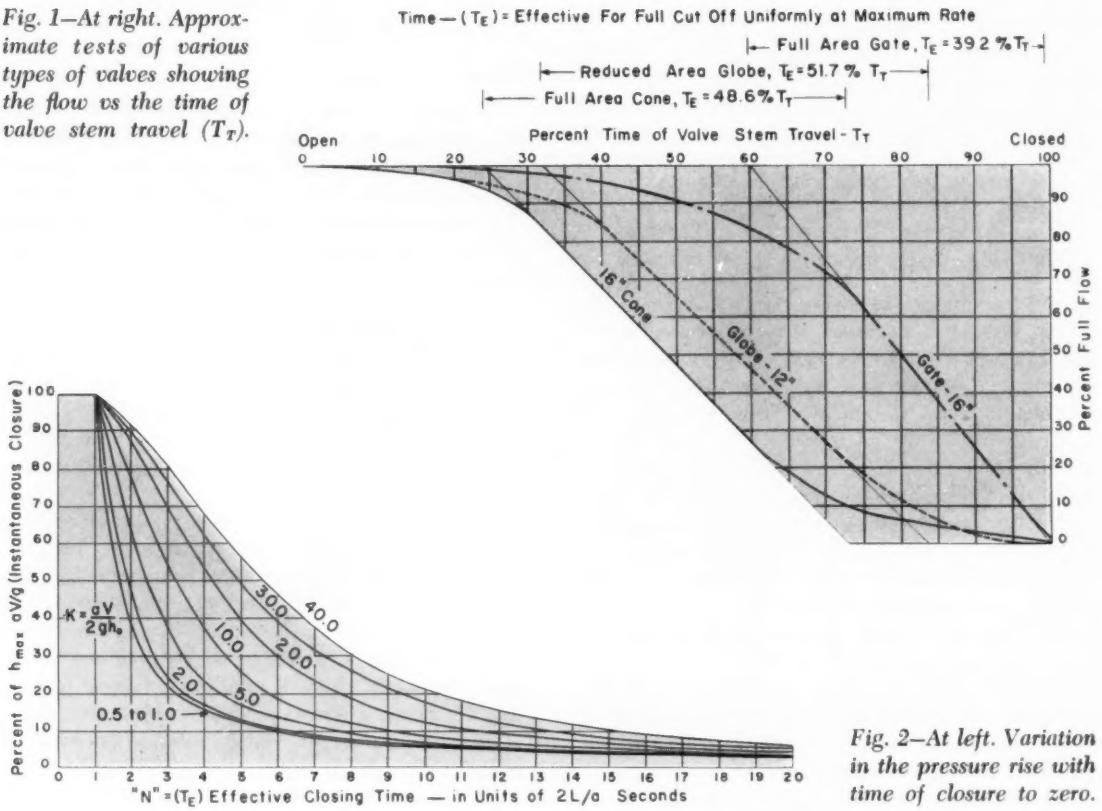

Time — (T_E) = Effective For Full Cut Off Uniformly at Maximum Rate
Full Area Gate, T_E = 39.2 % T_T
Reduced Area Globe, T_E = 51.7 % T_T
Full Area Cone, T_E = 48.6% T_T
Open
Percent Time of Valve Stem Travel - T_T
Closed
16" Cone
Globe - 12"
Gate - 16"
Percent Full Flow
Percent of h_{max} aV/g (Instantaneous Closure)
$K = \frac{aV}{2gh_o}$
40.0
30.0
20.0
10.0
5.0
2.0
0.5 to 1.0
"N" = (T_E) Effective Closing Time — in Units of 2L/a Seconds

Fig. 1—At right. Approximate tests of various types of valves showing the flow vs the time of valve stem travel (T_T).

Fig. 2—At left. Variation in the pressure rise with time of closure to zero.

and discussed frankly to avoid misunderstandings and possible disputes. Only a small proportion of most engineers' projects involve severe surge or water hammer, and specialized knowledge in this limited field cannot be expected of all consultants.

The cost of surge analyses, plus the equipment required to control pressures within safe limits, usually amounts to less than 2 or 3 percent of the total mechanical cost of the project. Its value as insurance against future damage makes it an excellent investment in advance of construction.

Summary of Water Hammer Theory

To guide the consulting engineer in deciding whether water hammer is of importance on a particular project, a little knowledge of the basic theory is important.

The phenomenon of water hammer, water ram, or surge has been known for a long time and references to it can be found in the literature during the last 100 years or more. In 1930 and 1931 a review was made by an ASME committee of the available literature on water hammer as published in English, either as original contributions or as translations of articles appearing in other languages.

A startling situation was immediately apparent. Six water hammer formulas in general use were found in various textbooks, handbooks, and engineering articles, and all gave different results when applied to the same basic example!

Compared to the proven elastic wave theory of Joukovski and Allievi, values varied from 35 percent below to 500 percent above the correct amount.

There was a germ of truth in each of these approximate formulas, for within certain narrow limits of application most of them gave correct answers. Unfortunately, these limits rarely were shown and outside of them substantial errors resulted.

Elastic Wave Theory

The accuracy of the elastic wave theory has been established by many experiments. Some of the earliest were carried out in Moscow, in the late 1890's, by Professor Joukovski. Without elaborating on the theory or giving a detailed analysis, the theory states that pressure changes in a closed conduit result from changes in flow which set up both positive and negative elastic waves. The summation of these waves establishes both the amplitude and shape of the resulting combined pressure

wave. This can be computed with accuracy, even for extremely complex conditions.

Certain fundamental factors are:

¶ Surge pressures in closed conduits are directly proportional to the rate of change in flow velocity.

¶ Surge pressures in closed conduits are also directly proportional to the velocity of the pressure wave transmitted along the conduit.

¶ The velocity of the pressure wave depends upon the elasticity of the conduit and the compressibility of the liquid.

¶ The pressure rise, when cutting off flow instantaneously, is independent of the normal pressure and of the length of the conduit.

¶ For effective closures equal to the critical time of the conduit or less, the pressure rise will be the same as for instantaneous closures.

¶ For effective closures in times longer than the critical time, the pressure rise will be reduced by reflected waves and the degree of reduction will depend upon the time of closure and the normal operating pressures.

¶ In complex designs variations in diameter, thickness or material of the conduit, branch pipes, or other characteristics, as well as frictional losses, can be accounted for by the correct application of the theory.

Fundamental Relations

Pressure rise in feet above normal for instantaneous water hammer is given by:

$$h = Va/g, \text{ where} \qquad (1)$$

a = velocity of pressure wave in ft/sec
V = velocity of flow in ft/sec
g = acceleration due to gravity (32.2 ft/sec^2)

The formula for surge wave velocity is:

$$a = 4660/\sqrt{1 + kd/Ee}, \text{ where} \qquad (2)$$

k = compressibility of the fluid (approximate values: 300,000 psi for water; 230,000 psi for crude oils; 130,000 psi for gasoline)
E = Young's modulus of elasticity of the pipe material (30,000,000 psi for steel; 12,000,000 to 15,000,000 for cast iron; 3,400,000 psi for asbestos cement; variable for reinforced concrete)
d = inside diameter of pipe in inches
e = thickness of pipe wall in inches

The critical time μ for a conduit is

$$\mu = 2L/a \text{ seconds}$$

where L is the length of the conduit in feet.

In water hammer calculations, this critical time often is used as a unit of time, with N defined as the number of such time units.

Effective Closing Rates

It can be demonstrated that water hammer pressures are a function of the maximum rate of change of flow. This is quite different from the rate of change of area or the time of stem travel on the valve-actuating mechanism.

To relate the types of valve movement to the actual changes in flow, an approximation can be made. If the total time of valve travel T_T is plotted against discharge or pipeline velocity, an effective time T_E can be obtained. This is the time in which full flow would be cut off if the change in flow was directly proportional to valve stroke, and the time of valve stroke was uniform throughout its full travel.

It is well known that the initial valve-closing movement from the full-open position results in only a small change in flow. As the midstroke is reached, the rate of flow-cutting increases. At some point it will reach a maximum. If this maximum rate of closure covered the full range in stroke, then equivalent time T_E would be the same as total time T_T and the ratio would be $T_E/T_T = 1.0$.

In most valves this ratio varies, and T_E/T_T will range from 0.40 to 0.60. An average of 0.50 can be assumed for approximate studies. An example is shown in Fig. 1.

Gradual Closures

When gradual closures (T_E greater than 2L/a seconds) exist, the pressure rise due to stopping the flow is reduced substantially. Fig. 2 shows this relationship for various effective times T_E and for various pipeline constants K.

Typical Example

Assume the simplest case (Fig. 3). A gravity line discharges under a head of 150 feet, with uniform thickness, diameter, and material of construction, giving a surge wave velocity of 3220 fps. Assume

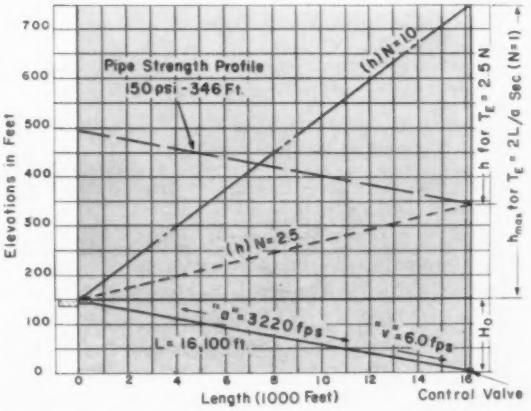


Fig. 3–Calculation of surge pressure developed when closing valve under conditions shown.

the pipe length is 16,100 feet, and the flow velocity is 6 fps, with no friction.

For instantaneous closure ($T_E = 0$) the surge would be aV/g or 600 feet, and the total pressure would be 750 feet.

If 150 psi (346 feet) pipe were used, the overpressure would be 404 feet, or more than twice the normal rating. This surge would be the same if $T_E = \mu = 2L/a = 10$ seconds.

If the total pressure was to be held to the rated value, the allowable surge would be limited to $346 - 150 = 196$ feet. The pressure rise must be reduced to $196/600 = 32.6$ percent of the instantaneous value, or the maximum flow limited to $6 \times 0.326 = 1.96$ fps.

Referring to Fig. 2, and computing the pipeline constant K, a value of $(3220 \times 6)/(2 \times 32.2 \times 150) = 2$ would be secured.

Following this curve to its intersection of approximately 33 percent of instantaneous pressure, the required T_E is 2.5 N, or 25 seconds.

However, if the effective time T_E is 0.5 T_T, then $T_T = 25/0.5$, or 50 seconds as the permissible travel time.

Complex Problems

With branch pipes; parallel conduits; variations in diameter, thickness, and materials; or when distribution systems or pump discharge lines are involved, many additional factors must be taken into account. All can be evaluated in a detailed surge analysis, and the maximum and minimum pressures at any point on the system established with a degree of accuracy dependent only upon the refinements in the computations and data available.

It is quite simple to include in surge analyses the pump characteristics, flywheel effect of rotating parts, profile of the pipeline, the rate of retardation and reacceleration of flow for pump discharge mains, and many other basic relations. The means best suited to control surges to safe values can be evaluated in each study.

Conclusions

No one solution to water hammer is suited to every situation. Each project presents a different problem. While some can be grouped together, no single surge control device can be used universally. All the devices now on the market have a measure of usefulness for one or more sets of conditions. Each has its own field of application.

The consulting engineer responsible for project design should understand surge problems or engage some consultant who does, and then he can select the type and size of equipment needed for his particular design. ▲▲

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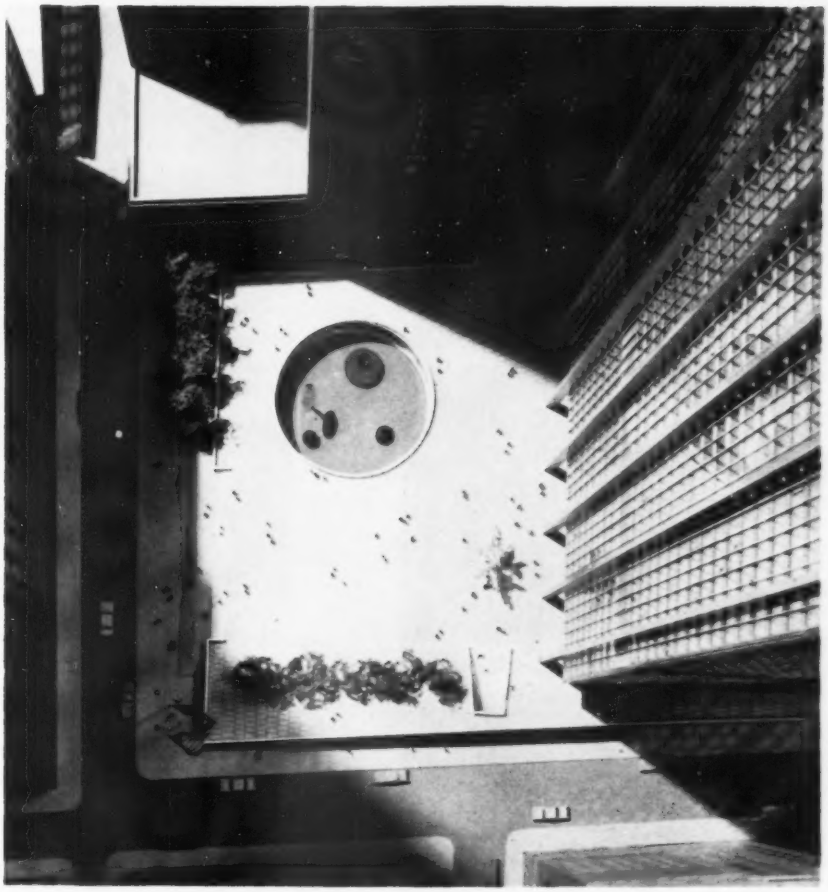
Note: Items 1 to 6 readily available at sources noted. Items 7 and 8 out of print, but usually available at Technical School libraries or from Engineering Societies Library, N.Y.



New buildings like Chase Manhattan need trained maintenance crews for curtain walls and the elaborate mechanical and electrical equipment.

Specifying For Maintenance

FRANCIS L. FRYBERGH
Skidmore, Owings & Merrill

Mr. Frybergh, a participating associate with Skidmore, Owings & Merrill of New York, studied chemical and industrial engineering at the University of Prague (Czechoslovakia), receiving his B.S. and Ph.D there. He joined Skidmore in 1951, and worked on the French Morocco airbases project, in Casablanca, until 1953. At present Mr. Frybergh is in charge of specifications in the firm's New York home office.

MODERN MATERIALS and surface finishes, new developments in the uses of traditional materials, and the complexity of machinery make the maintenance of a finished structure as much a consideration for the architect and his consulting engineer as construction supervision or design. This responsibility goes years beyond the physical acceptance of a building by the client, yet it is as much a part of the total design for a client as selection of materials or cost. Maintenance has become critical to both the designers and the owners of today's buildings with their vast surface areas, thorough mech-

Union Carbide is typical of new structures requiring special maintenance.

Connecticut General Life management had engineers train maintenance crew.

anization, and complete electrification. Maintenance costs have become of paramount importance in any successful architect-engineer-client relationship.

Engineering research people in the construction materials and equipment industry are searching constantly for improvements in materials, processes, methods of fabrication, finishes, and structural and mechanical design to better serve both the concepts of the architect and engineer, and the economic interests of the owner. Consulting engineers and architects are in full agreement as to the need to integrate continuing maintenance into over-all design, particularly with respect to job specifications. The nature and uses of the materials and products of present engineering research require exact maintenance procedures to retain the high qualities of appearance, and at the same time to realize the architectural and economic advantages for which they were developed.

An Engineering Responsibility

The normal practice on major jobs has been for the owner to contract for the care of his building with a maintenance organization. It is left to their crews to handle all details and to choose methods. Unhappily, this procedure frequently has proven detrimental to the life and appearance of the building and its equipment. The owner may well conclude that the project did not meet expectations, unaware that improper maintenance was the cause of his trouble. Therefore, to properly serve the client, architects and consulting engineers must give detailed specifications and instructions to ensure proper maintenance of both materials and equipment.

Maintenance Instruction Needed

Consulting engineers on all Skidmore, Owings and Merrill projects insist on a training period, of varying duration and intensity, for all maintenance personnel who are to operate any machinery.

For example, the Connecticut General Life Insurance headquarters building, Hartford, Connecticut, has heating, ventilating, and air-conditioning equipment aggregating 2400 tons capacity. Here the owner set up a permanent staff, and this staff was especially trained to maintain and operate this equipment as well as to service, maintain, and clean the entire building and grounds. All finish materials in this structure, which range from traditional to those specially developed for the building, receive the precise maintenance required to minimize costs yet preserve the original beauty of the structure.

This ideal answer to the maintenance problem is quite different from the customary outside contract arrangement.

Another example is the Chase Manhattan Bank building in lower Manhattan, with its 48 elevators. Like the Union Carbide Corporation building in mid-Manhattan, it will have a control center – a major design element as well as a highly intricate operating mechanism. Several hundred machines are controlled from this center. For this project, our consulting engineers specified a three-month training period for the maintenance men, with daily classes for elevator operators and starters. Certificates of satisfactory completion of the instruction courses were required. Similar classes will be provided for employees responsible for heating, ventilating, electrical, and air-conditioning equipment.

It is essential today that the client be provided with operation and maintenance that matches the high quality of the specified equipment. Job specifications must provide for this insofar as practicable. On a $6-million refrigeration plant, the costs of assured expert operation amount to only an additional fraction of 1 percent of the over-all costs. This cost is highly justified by the results.

Information, Please

In the same manner, the specifications for a structure should include detailed instructions for its cleaning and for the care of the finishes and surface materials in it. Often it also is wise to include specifications for maintenance of fixtures, appliances, and accessories. Appearance, function, and cost of construction materials all have been studied thoroughly by both designers and producers. Much progress has been made. It is not logical to jeopardize any of these benefits through unsuitable or inadequate methods of maintenance and care. Frequently, impaired appearance and function and unwarranted costs result. Specifications must make it possible for the owner to get all the advantages originally engineered into the materials in his building throughout their life.

Most manufacturers furnish full details on care and maintenance of their products. These may be provided separately to the maintenance personnel responsible for various types of equipment, or consolidated into cleaning and maintenance manuals for surface finishes and materials. Charts and diagrams, as required, should be included. Manuals must be supplied in sufficient quantities and in the clearest possible language. These manuals and supplementary provisions of the specifications should be made a part of maintenance contracts entered into by the owner.

Do not hesitate to specify maintenance materials by proprietary names. Maintenance personnel will better understand what is required, and owners can more easily control maintenance work. The most routine types of cleaning and maintenance operations in today's buildings – as on marble, ceramic tile, resilient flooring, stainless steel, aluminum, plastics, wood finishes – can be perilous if undertaken by haphazard methods. Misuse of abrasives, acids, or alkalis, or improper or untimely application of protective coatings, can spoil the appearance and cause costly if not irreparable damage to the various materials of construction.

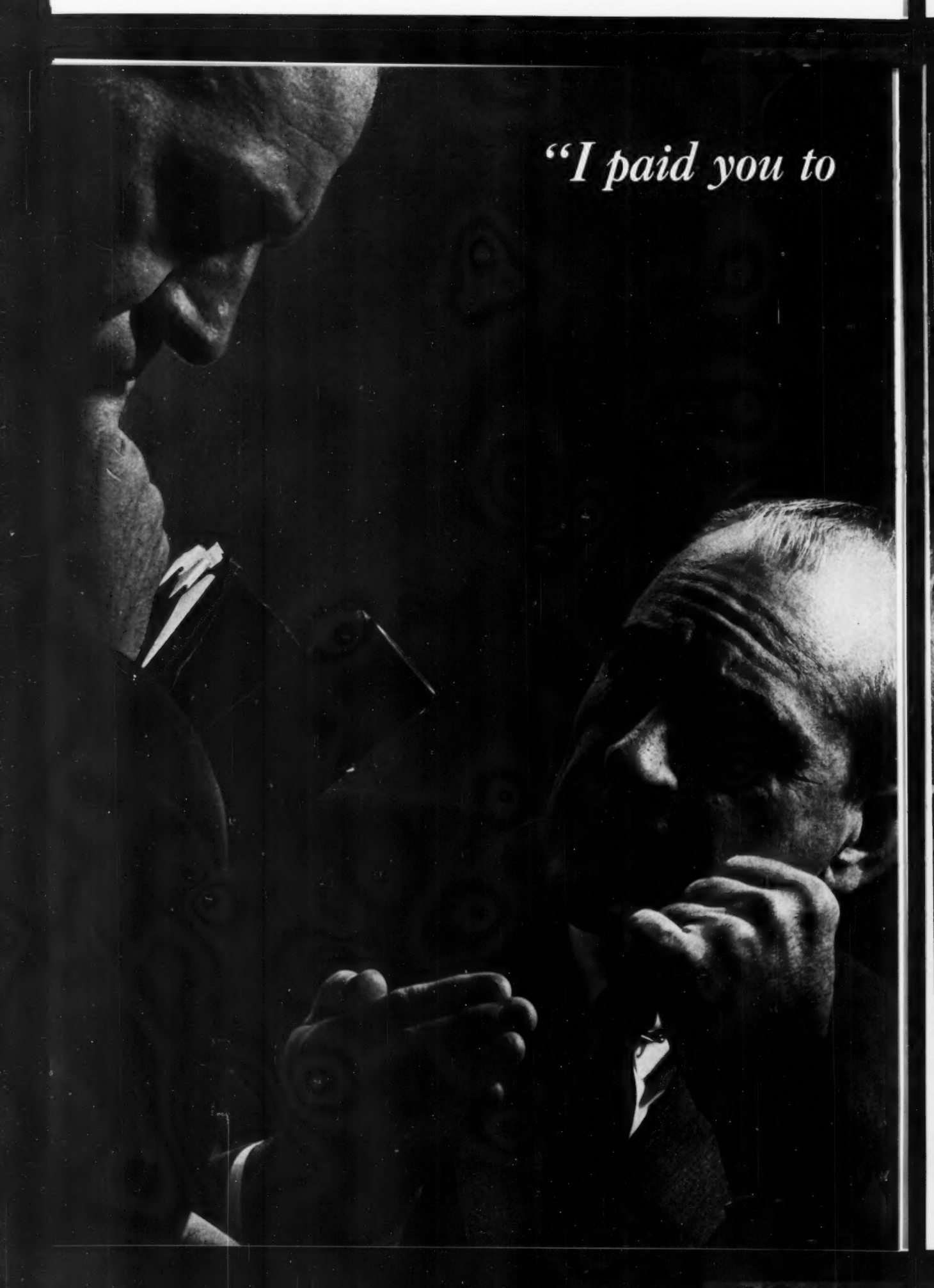
For the most part, maintenance organizations are aware of their responsibilities. With the proper training they can be made to understand the nature of the materials specified and the reasons for specifying them. Understanding this, they take professional pride in their work.

Maintenance is Part of the Structure

The occasional initial hesitation of manufacturers to discuss freely the perils of improper use of their products usually is succeeded by the realization that an honest approach to the maintenance problem is not only essential to the consumer of their products but vital to themselves.

The architect and his engineers must specify a structure and equipment that not only meets original expectations but also operates smoothly and weathers the ensuing years of maintenance, passing on to the owner every maintenance benefit built into his materials by the most advanced manufacturing technology. Skidmore, Owings and Merrill considers provisions for maintenance an indispensable part of job specifications. Our consulting engineers agree with this concept. ▲▲

Maintenance men were trained three months to care for Chase Manhattan building.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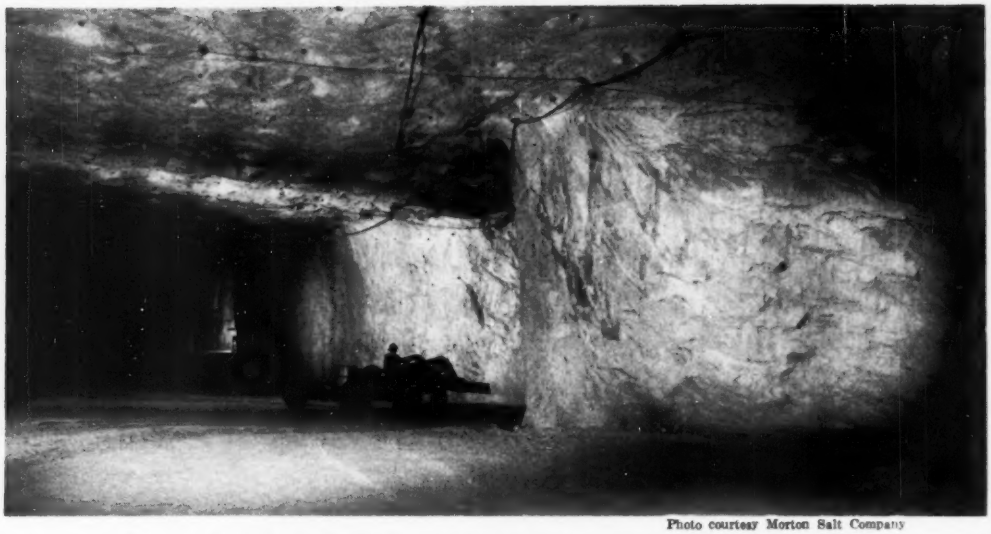

Photo courtesy Morton Salt Company

We might store radioactive waste in these huge man-made salt caverns.

Disposal of Radioactive Waste

LINVIL G. RICH, Illinois Institute of Technology

Linvil G. Rich served with the Armed Forces during World War II, and then he obtained his B.S., M.S., and Ph.D. degrees from Virginia Polytechnic Institute. He remained at V.P.I. as head of Sanitary Engineering until 1955, and then accepted a U. S. Public Health Service assignment to Bolivia. Returning to the U. S. in September 1956, he joined the teaching staff of Illinois Institute of Technology as an associate professor in charge of graduate instruction in sanitary engineering. Along with teaching, he has been active in consulting and research. He is a member of six honor societies and the American Society of Engineers, and is a licensed P. E. in Virginia, West Virginia, and Illinois.

THE PROBLEM OF disposal of radioactive waste products has paralleled the development of nuclear power in this country. Concepts ordinarily employed in industrial waste treatment cannot be applied to long-life radioactive wastes, and the safety of future generations requires that methods of disposal be judged not only by economics but by the degree of protection afforded the public.

CE exclusive

Long Lived Waste

The principal problems associated with the handling and disposal of gaseous and solid radioactive wastes and low-level liquid wastes have been solved. Considerable progress has been made toward quantitative evaluations of the dilution factors indigenous to the atmosphere and to inland waterways, although assessments of those in geological formations and in the oceans await further exploration. Furthermore, the effect of relatively low levels of activity on a variety of water and sewage treatment processes has been determined.

At present, the ultimate disposal of low-volume, high-level liquid wastes resulting from the chemical processing of spent reactor fuel elements is still an unsolved problem. Since the dangerous radioactive life of some of the fission product mixtures making up these wastes is of the order of several hundred years, and since the future portends great volumes of wastes, the current practice of storing wastes in tanks is not considered a permanent solution to the problem. Also, because of the large amounts of radioactivity involved, it appears there is insufficient dilution available in nature for any

safe, practical dispersal of these materials in the environment.

A preliminary evaluation has been made of the direct discharge of the untreated liquid wastes into selected underground formations. In some areas of this country this practice might prove satisfactory. However, considering the long-term aspects of the radiation hazard along with the dearth of information concerning the geologic details of these formations, it is doubtful that any regulatory controls could be exercised over this type of disposal.

One Possible Answer

One method of isolation has been advanced that appears entirely acceptable from the standpoint of public protection. Ideally, the method would consist of fixing the activity in a nonleachable solid, enclosing the solid in a permanent container, and then storing the contained solid in a seismically stable and dry geological formation. The integrity of the system would be ensured by a series of barriers, and the failure of all would have to occur before a release of activity would result.

At several AEC and contractor installations, research currently is being conducted on the immobilization of the activity by reducing the wastes to solids. Several of the projects appear promising. If it is assumed that a satisfactory process can be carried out along these lines, then attention can be directed toward the other two elements of the system – the container and the storage location.

The integrity of the container element will depend primarily upon the storage environment. Consequently, storage location must be established and characteristics of the environment determined prior to any consideration of container properties.

A Saline Solution

Centuries are required for several of the isotopes in high-level wastes to decay. Therefore, the storage environment must provide maximum assurance that the activity will remain intact for several hundred years. Are there such environments and, if so, what is their nature?

Articles of copper and bronze which have been buried for a thousand years or longer have been found by archeologists in a relatively unaltered condition. Where these articles were found the climate had been arid for centuries. It was concluded, therefore, that environments do exist where metallic materials could be depended upon to last for many years. Without exception, these environments are extremely dry.

It has been suggested that salt mines might be used as a repository for decaying radioactive wastes. In particular, salt beds and salt domes appear to be the most feasible types of formations for this purpose. Mined-out salt operations have considerable structural stability, are very dry, and are located in areas that are geologically stable. In addition, salt deposits are abundant and relatively widespread. The great commercial deposits of the United States are found in New York, Ohio, Michigan, and Kansas. The estimated reserves of these deposits are:

New York	1635×10^9 tons
Ohio	1692×10^9 tons
Michigan	6110×10^9 tons
Kansas	5000×10^9 tons

Salt bed thicknesses range from a few feet to almost 800 feet. Depths vary from 600 to 8000 feet. Salt domes in Louisiana and Texas constitute additional reserves. Salt domes differ considerably in details of shape and origin, but they tend to have a cylindrical shape with a diameter of about a mile near the top. Some rise to within a few hundred feet of the surface; others get no nearer than a few thousand feet.

Back to the Salt Mines

Salt is mined both mechanically and hydraulically. The cavities formed by hydraulic mining are inaccessible and the possibility of their collapse are considerable, making it inadvisable to consider their use for disposal. Dry mines (mechanically mined) tap the salt bed despoits of New York, Michigan, and Kansas at levels ranging from 800 to 2000 feet beneath the earth's surface. Rooms 50-ft wide open on 100-ft centers leaving 50-ft

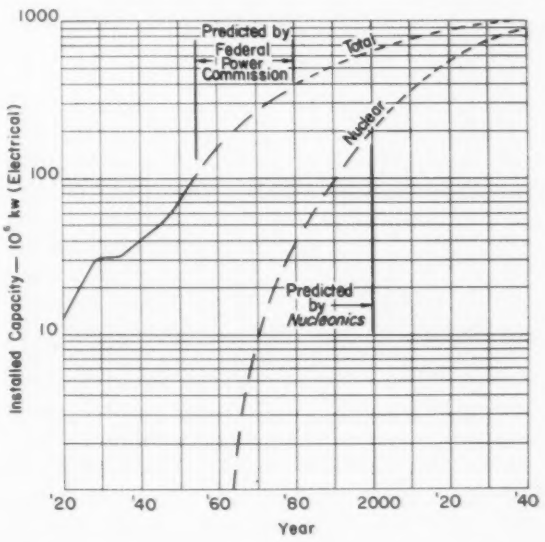

Fig. 1—The estimated total and nuclear electric power capacity in the continental United States.

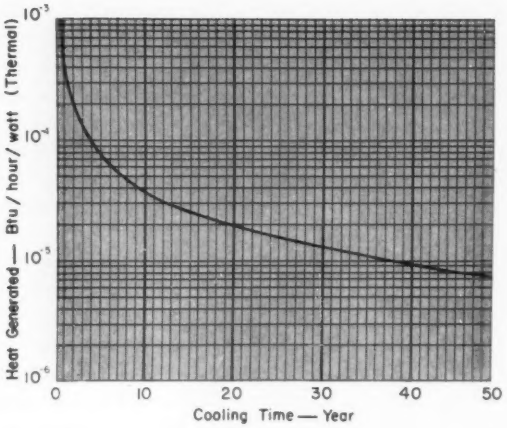

Fig. 2 – Heat generation from fission product decay after an initial one-year irradiation.

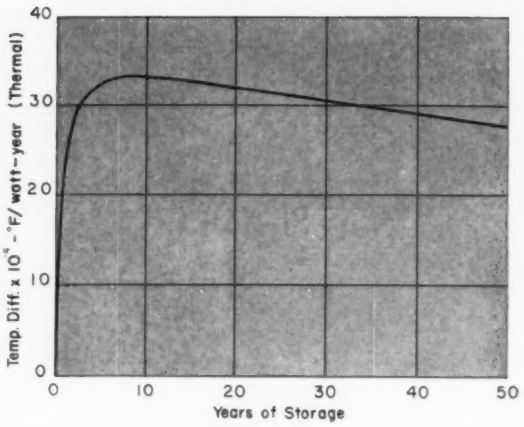

Fig. 3–Difference between temperature of mine walls and initial temperature of the formation.

pillars for roof support. The mining operations consist of undercutting, drilling, blasting, and loading. The working face varies from 20 to 30 feet. About 60 percent of the salt is recovered, and the remainder is left in pillars. All operations in the mine are confined to one level.

Salt domes are mined mechanically by a method different from that employed in the deposited beds. A 15-ft diameter shaft is sunk into the dome to a depth of about a thousand feet. A working face is created by blasting out a large main chamber from which galleries are driven through the salt, and more rooms blasted and excavated. Operations have opened up rooms that are 70- to 90-ft high, the roof being supported by columns that are approximately 70 feet square. Operations may extend to other levels.

There are sufficient salt reserves in which to store all the radioactive wastes that could reasonably be produced in the future. The question is – will mined-out operations be extensive enough to accommodate these wastes as they are produced? Although the cost of mining salt is not great, there still would be a distinct financial advantage in the use of mined-out operations, provided that they could be used for storage purposes without costly modifications.

Future Power Needs

As the initial step toward finding the answer to this question, Fig. 1 was constructed using data published by the Federal Power Commission. On this chart, one curve shows what the installed electric power capacity in the United States has been in the past and what the Commission believes it will be in the years up to 1980. Following the trend established by the upper portion of the curve, the curve from 1980 was extended to several decades in the future.

A second curve was constructed from a published prediction of how much nuclear electric power capacity will be in existence in the years from 1970 to 2000. This curve was extended to converge on the first curve during the latter half of the 21st century. It is reasonable to assume that then fossil fuels may be approaching depletion.

Temperature Problems

The quantity of radioactive wastes that can be stored in mined-out operations is dependent primarily upon the thermal effects resulting from the activity of the wastes. Volumetric considerations are only secondary. Consequently, the rate at which heat is produced per watt of thermal nuclear power was estimated, based on the fission product yields from the fast fission of U-235 and the decay rates. An irradiation period of one year was assumed. These data are illustrated on Fig. 2, which shows heat generation per watt of thermal nuclear power plotted against cooling time.

It will be noted from this cooling curve that the quantity of heat liberated during the first few years of cooling is very high compared to that during the subsequent period. If the wastes can be cooled initially at some installation at the surface, say at the spent fuel processing plant itself, then not only will the handling and storage operations be simplified, but a greater use of the available storage can be made as well. Therefore, the assumption was made that the wastes would be stored in the salt formations after an initial cooling period of two years.

To make the storage system as isolated and independent of maintenance as possible, it was as-

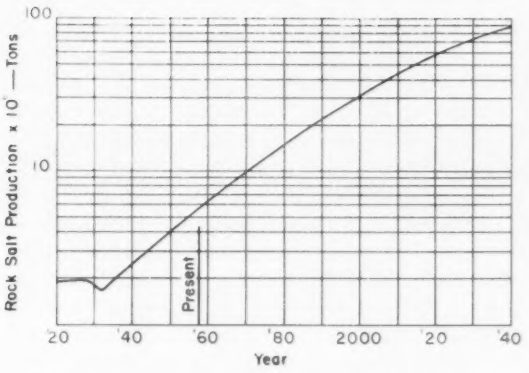

Fig. 4 — Past and predicted production of mechanically mined rock salt in the United States.

sumed that the earth could be used as a heat sink, thereby eliminating the need of a cooling system. The difference between the temperature of the roof and floor of the salt cavity and the initial temperature of the surrounding geologic formations was computed for different time intervals on a per watt-year (thermal) basis.

Mine Capacity

In making the computations, the salt cavity was considered a semi-infinite slab, and the rates at which the heat would be liberated were determined by graphical integration of the cooling curve. It also was assumed that the geological formations would be limestone, because the rock formations generally associated with salt beds are in large part limestone and sandstone. (Sandstone has co-efficients of conduction and diffusivity only slightly greater than limestone.)

The resultant values relating time to the temperature difference in degrees F per watt-year of thermal nuclear power per square foot of mined-out operations are presented in Fig. 3. From this chart it is seen that the maximum temperature difference per watt-year (thermal) is approximately 33×10^{-4} F, this temperature being reached in about eight years after placing the wastes in the mine. If the initial temperature of the geological formations is 60 F, and the wall temperature inside the mine is arbitrarily taken to be 210 F, then approximately 4.53×10^{4} watt-years (thermal) can be accommodated per square foot of mine.

Data are available on the past production of mechanically mined rock salt in the United States. These data have been plotted and a curve constructed (Fig. 4). The curve was extended along a trend established since 1935. Starting with 1960, at which time it is estimated that 140×10^{6} tons will have been mined, a summation curve (Fig. 5) of anticipated salt production was computed and constructed.

Assuming that in the future, as at present, 75 percent of the salt mechanically mined will come from salt beds and the remainder from domes, and using average dimensions of mined-out spaces, it was found that each ton of salt mined will create 0.77 square foot of mined-out area. Inasmuch as the roofs of cavities in salt domes are high and since it was assumed that the domes ultimately would be worked at three levels instead of one, about 0.74 square foot of the total is attributed to mining operations in salt beds.

For a thermal-to-electrical conversion efficiency of 25 percent and an operational load factor of 80 percent, the number of tons of salt that must be

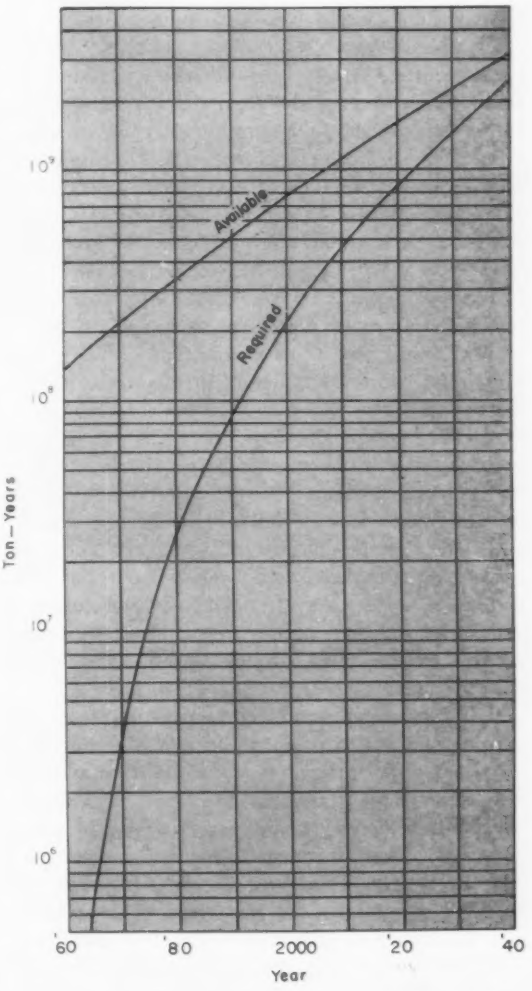

Fig. 5 — Required storage compared with available space, based on total salt production tonnage necessary to produce this storage space.

mined to provide storage for the waste resulting from each watt-year of nuclear electricity will be:

$$\frac{0.80}{0.25} \times \frac{1 \text{ sq ft}}{4.53 \times 10^4} \times \frac{1 \text{ ton}}{0.77}$$

$= 0.918 \times 10^{-4}$ tons per watt-year (electrical)

The total number of electrical watt-years produced from nuclear energy up to any year can be determined by making a summation of values taken from the curve labeled "nuclear" in Fig. 1. This number, when multiplied by the factor computed above, will give the tons of salt that will have to be mined to produce storage space sufficient to accommodate the fission wastes produced to that date. The number of tons required at any date can be obtained from the lower curve in Fig. 5.

From the two curves in Fig. 5, it appears that for at least 100 years, there will be storage space sufficient for anticipated waste production.

As a result of the hydroscopic nature of salt deposits, salt mines are normally dry. Although the humidity in ventilated mines will fluctuate within rather wide limits, the humidity is low in mines where there is little or no ventilation. It is believed that in a sealed-off mine the relative humidity will not exceed 10 percent. Thus, as long as the isolation afforded by a sealed-off mine remains intact, the environment will be relatively non-corrosive.

The salt deposits of New York, Michigan, Ohio, and Kansas are located in areas which, in recent geologic time, have been seismically stable. The horizontal nature of the beds themselves testify to the absence of active mountain building processes. In all likelihood these regions will continue to be relatively stable. However, should the integrity of the mine be disrupted either by natural causes or by man-made forces, the container may be subjected to a quite different environment. The most critical environment would result from the infiltration of water. Brine, particularly hot brine, is extremely corrosive. In any event, the design must provide for the most critical condition that could possibly occur.

It is necessary to make certain assumptions concerning the waste composition and the container dimensions. For present purposes let it be assumed that, after fuel processing, the waste will consist of alumina (density of 50 lb per cu ft) in which the fission product concentration will be one percent by weight. To reduce the heat problem and to facilitate handling, it is assumed that the alumina will be packaged in 3 in. x 4 ft x 1 ft containers. After two years precooling at the surface, the containers will be sealed in the salt formations.

At the concentration assumed each container will accommodate the wastes resulting from the production of 5.95×10^5 watt-year (thermal) of power. The maximum temperature at the centers of the containers at the time of storage was estimated to be 230 F. The most critical condition to which the container is likely to be subjected, therefore, is brine at a temperature no greater than 230 F. This temperature will exist at the time the container is stored and will decrease thereafter.

Ceramics are the least affected by corrosion, but they lack the structural strength required of a packaging material. Consequently, attention was confined to metals employed in contemporary technology. Stainless steels, aluminum, magnesium, and magnesium alloys are vulnerable to brines. Nickel and the cupronickel alloys, on the other hand, exhibit a high resistance to such solutions. At present, the nickel materials are too expensive to be considered for this purpose. A compromise material would be a likely choice. Subjected to the most severe conditions, one-eighth inch aluminum-bronze could be expected to last a decade. Longevity of this magnitude would permit the integrity of the container to be maintained until steps could be taken to repair any damage to the storage environment.

Economically Feasible

It is believed that high-level radioactive wastes can be concentrated and converted into solids at a cost of no more than 10 cents per gallon. Containers probably can be fabricated out of one-eighth inch aluminum-bronze at $50 per cubic foot capacity. The cost of mined-out operations in salt deposits is unknown. However, it is reasonable to expect the cost to be no more than $1 per square foot of floor space. Based on these figures the cost of the system can be estimated in part.

Concentration and conversion of wastes to solids	0.05 mills/kwh
Container	0.04 mills/kwh
Storage space	0.01 mills/kwh
Total	0.10 mills/kwh

To be competitive, nuclear power, in general, must be produced at a total cost of 7 to 8 mills per kwh. Of this amount perhaps a maximum of 0.15 mills can be spent on the entire disposal scheme. Consequently, there would be available 0.05 mills per kwh to cover handling, supervision, and monitoring of the storage system, and the treatment and disposal of the more readily handled low-level wastes generated by nuclear power.

So it appears, on the basis of the present study, that if an economical method can be developed whereby the activity of the waste can be concentrated and fixed in a nonleachable solid, a system of isolation is available for the ultimate, safe, and economical disposal of this country's high-level radioactive wastes. ▲▲

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Close-up showing canopy, extra-safe multiple "AA-51" contact threads, and anti-vibration guard with V-shaped metal prong before engaging canopy notches.

Canopy is securely locked against vibration disturbance by positive engagement of V-shaped metal prong in tightly sealed canopy notch. This anti-vibration guard may be quickly released by hand pressure for maintenance.

Similar in action to canopy guard, this close-up shows anti-vibration guard locking globe ring to dome unit assembly. Metal prong in dome unit is securely engaged by notched globe ring to prevent accidental loosening. This anti-vibration guard also may be quickly released by hand pressure for maintenance.

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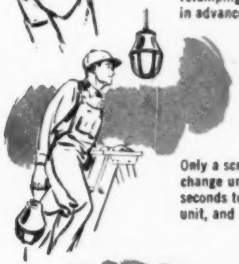

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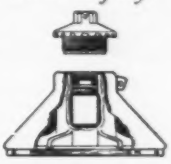

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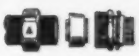

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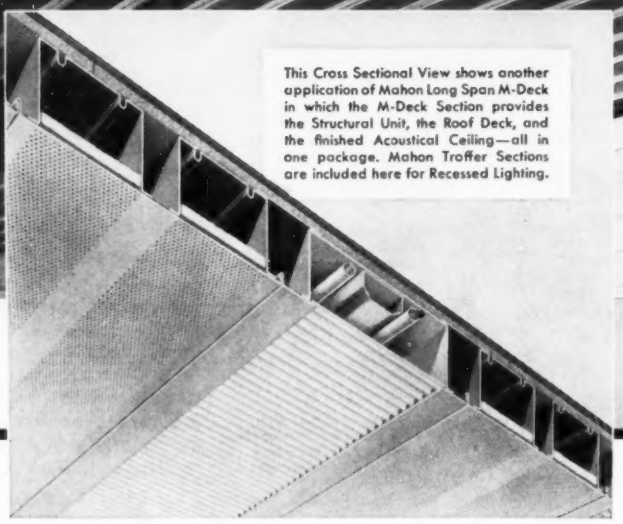
Malleable Iron Unilets

M-DECKS Span from

In a 24 Room Addition to the Reeths-Puffer High School, Muskegon, Michigan, Mahon Long Span M-Deck Section M1-OB was used exclusively for the Roof. A Perforated Metal Acoustical Ceiling was attached directly to the bottom flanges of the Open Beam M-Deck Sections. R. S. Gerganoff Architect. Muskegon Construction Company, General Contractors.



This Cross Sectional View shows another application of Mahon Long Span M-Deck in which the M-Deck Section provides the Structural Unit, the Roof Deck, and the finished Acoustical Ceiling—all in one package. Mahon Troffer Sections are included here for Recessed Lighting.

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A Mahon Product with Broad Application in Roof and Combined Roof-Ceiling Construction

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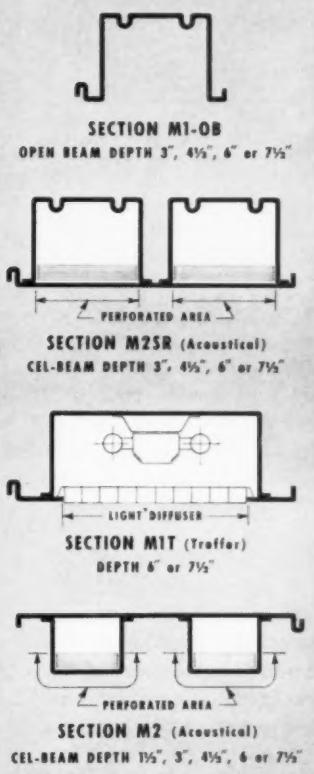

SECTION M1-OB
OPEN BEAM DEPTH 3", 4½", 6" or 7½"

SECTION M2SR (Acoustical)
CEL-BEAM DEPTH 3", 4½", 6" or 7½"

SECTION M1T (Troffer)
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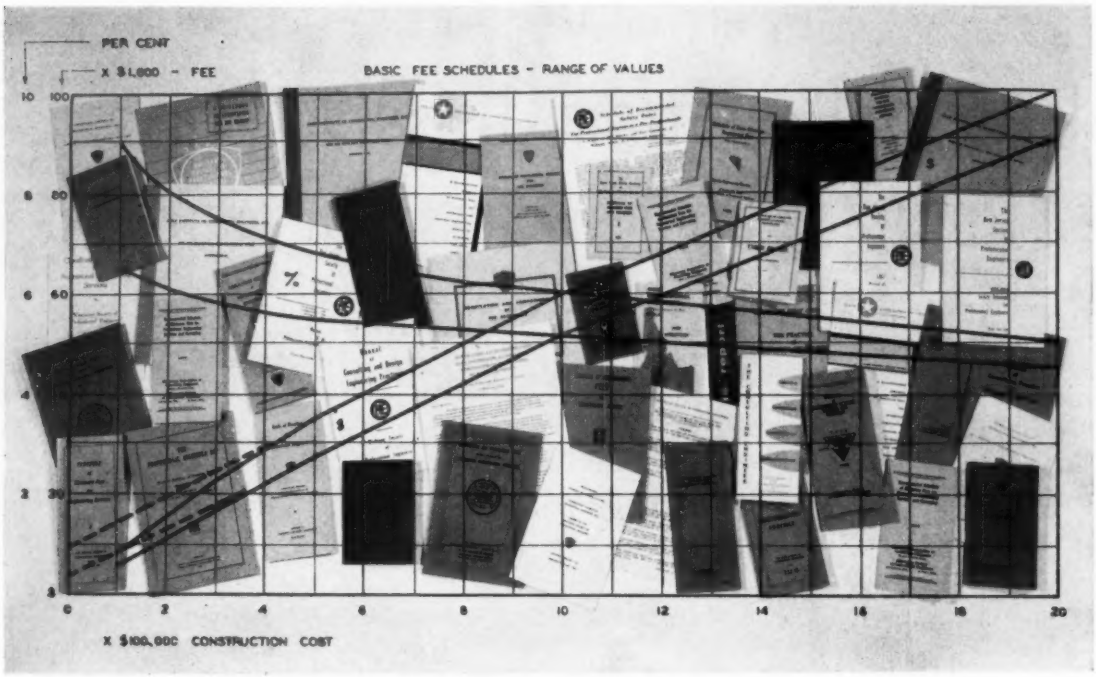

A Bibliography of Fee Schedules For Consulting Engineers

STAFF PREPARED

THIS BIBLIOGRAPHY of recommended consulting engineering fee schedules has been compiled by CONSULTING ENGINEER, after a survey of publications of all the national and state engineering societies. This bibliography is arranged alphabetically by national or state organizations. It lists the title of the publication, date of latest printing, price, if any, and a brief description of the contents.

CE exclusive

A review of these various fee schedules shows a fairly close correlation among them, ranging within a few percentage points of each other. Even per diem engineering fees, which jump from $17.50 to 10 times that amount, are generally pretty close.

Consulting engineers interested in securing any of these schedules should write the secretary of the organization at the address given. Where new editions are scheduled, the approximate publication date is shown.

National Fee Schedules of U.S. Associations

American Institute of Consulting Engineers, 33 West 39th St., New York 18, N.Y. *Schedule of Fees* (1952) $0.25.

This 18-page booklet begins with a discussion of consulting engineering services, and continues with a comprehensive treatment of lump-sum, percentage, per diem, cost-plus, and direct salary fees. The

booklet also includes a median fee table based on percentage of construction costs.

American Society of Civil Engineers, 33 West 39th St., New York 18, N.Y. *Manual of Professional Practice for Civil Engineers* (1956) $1.00.
This 20-page pamphlet includes a code of ethics for engineers, discussion of an engineer's duties, points on government work, a contract check list, a treatment of percentage, lump-sum, cost-plus, per diem or hourly, and retainer fee arrangements, and a full-page graph of median fee percentages with three pages of explanatory material.

American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. *Manual of Consulting Practice for Mechanical Engineers* (1956) $1.50.
This 14-page brochure includes a section on suggestions for clients on retaining an engineer, a brief discussion of the role of the engineer, a check list of contract provisions, and a comprehensive treatment of median percentage, lump-sum, annual retainer, cost-plus suggested charges and their bases, including mention of direct costs and overhead, plus a half-page graph of median percentage fees. Other sections cover construction delays, patents, confidential data, and code of ethics.

Engineers Joint Council, 29 West 39th St., New York 18, N.Y. *The Practice of Consulting Engineering* (1957) $1.50.
Much of this 12-page booklet is the same as the Mechanical Engineers manual. It includes canons of ethics for engineers, a section on the engineer-client relationship, suggestions for choosing an engineer, a discussion of consulting engineer services, a contract check list, and a description of and bases for percentage, per diem, retainer, and lump-sum fees, plus mention of direct and overhead costs.

National Society of Professional Engineers, 2029 K St., N.W., Washington 6, D.C. *Compilation and Comparison of Fee Schedules* (1956).
This is a resume of state fee schedules, along with a full-page graph showing the range of percentages, the work usually included and excluded, basis for figuring additional costs, and a table of professional and preprofessional positions showing grades, duties, responsibilities, and qualifications.

Fee Schedules of Canadian Associations

Association of Consulting Engineers of Canada, Room 604, 620 Cathcart St., Montreal, Quebec, Canada. *Tariff of Fees and General Conditions* (1957).
This 30-page booklet covers all phases of professional engineering services, including preliminary work, the consulting services with various arrangements of supervision, and fee schedules based on time, percentage of construction cost, cost-plus, and lump-sum. Three tables show fee percentages for various classes of services. The booklet also includes a summary of conditions of engineering services, a description of special services, and additional charges for extra expenses and design variations.

Association of Professional Engineers of Ontario, 236 Avenue Road, Toronto 5, Ontario, Canada. *Schedule of Minimum Fees for Consulting Professional Engineers* (1954).
This 12-page book begins with a resume of the professional engineer's duties to the public, his employer, and other engineers; a schedule of fees for time and percentage bases and for normal and complex work; and a four-page standard agreement form bound in the back of the book.
Schedule of Minimum Fees for Consulting Professional Engineers Services to Architects (1954).
This four-page folio has a time table of suggested charges, a percentage table of charges, and material covering various phases of consulting engineering work. A 4-page standard agreement form is bound in the back of the book.

Fee Schedules of State Associations

Alabama

Alabama Society of Professional Engineers, James A. Evans, Brown-Marx Building, Birmingham 3, Ala. No publication at present; a fee schedule and manual of practice are tentatively scheduled for publication in late 1958.

Arizona

Arizona Society of Professional Engineers, Russell D. Taylor, 15 East Alameda, Tucson, Ariz. Nothing at present; a directory and manual of practice are tentatively scheduled for mid-1958.

Arkansas

Arkansas Society of Professional Engineers, Robert H. Boyd, P.O. Box 2836, Little Rock, Ark. *Salary and Fee Schedules* (1953).
The 36-page booklet includes the society's constitution and bylaws, dues, fee schedules for general, mechanical, structural, and electrical consulting engineering services; services included and excluded; salary schedules for engineers and aides; canons of ethics; and state laws on professional engineering.

Colorado

Professional Engineers of Colorado, Vernon Konkel, P.O. Box 2522, Denver 1, Colo. *Proposed Schedules for Preprofessional & Professional Positions* (1956).
Twelve sheets cover fee schedules and salaries, and

qualifications and responsibilities of preprofessional and professional engineers.

Connecticut

Connecticut Society of Professional Engineers, Llewelyn M. Reed, P.O. Box B, Devon, Conn. *Manual of Professional Practice* (1955) $0.50.
This 12-page manual includes an engineer's creed, a discussion of the scope of engineering services, fees, charges for basic engineering, other services, supplementary expenses, and special services; plus separate fee schedules for general engineering, structural engineering, inside mechanical and electrical engineering, engineering for power plants, chemical plants and the like, and site improvement and utility engineering. Includes a sample owner-engineer agreement.
Manual of Interprofessional Practice (1955) $0.50.
This 8-page manual on architect-engineer relations has an engineers' creed, explanations of the scope of engineering services, fees and charges, special payments, and data and information required of architects. Includes minimum fee schedules for structural engineering, mechanical and electrical engineering, and site improvement and utility engineering services done for architects, and a sample architect-engineering agreement.

Florida

Florida Engineering Society, Frederick J. Donahue, Jr., Gainsville, Fla. *Schedule of Basic Minimum Engineering Fees* (1955) $0.50.
The 12-page booklet features a full-page distribution graph plus a discussion of minimum fees, engineering services included and not included in the fee, extra services, personal service charges, and per diem rates; also minimum fees on salary, lump-sum, retainer, and contingent bases.
Schedule of Fees for Specialized Engineering Services (1956) $0.50.
Here are 12 pages covering engineering done for architects or other engineers; including fees for structural, mechanical, and electrical engineering.

Georgia

Georgia Society of Professional Engineers, J. Wylly Keck, Jr., 230 Spring St., N.W., Atlanta 3, Ga. Present fee schedules currently are being revised.

Consulting Engineers Association of Georgia, T. Z. Chastain, 1309 Candler Building, Atlanta 3, Ga. *Schedule of Minimum Fees (Owner)* (1958).
An 8-page pamphlet covers remodeling, altering, or additions to existing structures for the owner. The booklet includes fee schedules for electrical and mechanical work, services included and excluded under the minimum fees, a code of ethics, and a full-page table of responsibilities and duties of professional and preprofessional engineers.
Schedule of Minimum Fees (Architect-Engineers).
This 8-page booklet includes schedules of minimum fees for mechanical and electrical work performed for an architect or engineer, a discussion of the services included and excluded, special services, a code of ethics, and a full-page table of responsibilities and duties of professional and preprofessional engineers.

Idaho

Idaho Society of Professional Engineers, Walter H. Smith, P. O. Box 548, Boise, Idaho. *Public Directory of Services* (1957).
A 16-page booklet with a section covering the relationship between the public official and the professional engineer, this publication has a full-page graph showing the recommended minimum fee schedule, a discussion of services included and not included, information about securing competent engineering services, and a roster of Idaho professional engineers.

Illinois

Illinois Society of Professional Engineers, P. E. Roberts, 614 East Green St., Champaign, Ill. *Schedule of Recommended Fees for Engineering Services* (1956) $1.00.
The 16 pages include the minimum fee schedule, fee distribution, services included, hourly and per diem fees, legal work, discounts for architects and other engineers, and a code of ethics for engineers.

Indiana

Indiana Society of Professional Engineers, W. L. Sweet, 215 Farmers Trust Building, Fort Wayne, Ind. *Schedule of Minimum Fees for Engineering Services* (1954) $2.00.
This 20-page booklet covers fee schedules for general, construction, equipment, foundation, structural, electrical, and mechanical engineering; services included and excluded; a discussion and schedule of per diem, lump-sum, legal, and extra fees; and sample owner-engineer agreement forms.

Iowa

Iowa Engineering Society, A. F. Faul, 418 Hubbell Building, Des Moines 9, Iowa. *Recommended Salaries and Fees for Professional Engineers* (1950).
The duties, responsibilities, requirements, and minimum salaries of professional and technical-grade engineers are included in this 24-page booklet, along with a schedule of minimum fees for general engineering, the services included and excluded for this minimum charge, suggested per diem fees, surveying fees, a suggested form of contract, re-

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quirements for Iowa registration, and a code of ethics for engineers. A new fee schedule is slated for publication this summer.

Kansas

Kansas Engineering Society, Guy E. Gibson, Jr., 1157W State Office Building, Topeka, Kans. Nothing is available at present but information now is being compiled.

Louisiana

Gulf Institute of Consulting Engineers, G. A. Heft, 820 Union St., New Orleans, La. *Fees for Mechanical and Electrical Work (Owner)* (1957).
This 4-page booklet includes the percentage fee schedules; a discussion of the services and their scope; suggested minimum hourly, per diem, and special condition fees; plus a full-page graph of fee percentages.
Fees for Mechanical and Electrical Work (Architect-Engineer) (1957).
This is a 4-page companion volume to the above work, covering the same material but with relationship to architects and other engineers. A graph is included.
Fees for Civil and Structural Work (Owner) (1957).
A 6-page booklet giving fee percentages, services included and not included, scope of engineering services, special conditions regarding fees, suggested per diem and hourly fees, and subcontracting percentages.

Massachusetts

Eastern Massachusetts Association of Professional Engineers and Land Surveyors, Brenton Schofield, 48 Park St., Framingham. *Book of Policy* (1953).
This 24-page booklet includes a Biblical quotation (Deuteronomy 27:17), statement of policy, constitution and bylaws of the association, code of ethics, discussion of surveying standards, list of members, and a recommendation for minimum surveying fees.

Michigan

Michigan Society of Professional Engineers, Richard M. Cosgrove, 817-18 Prudden Building, Lansing 16, Mich. *Manual of Consulting and Design Engineering Practices* (1957) $0.25.
This 22-page volume includes a discussion of the engineer's tasks, the bases of engineering charges, a percentage fee table, a full-page graph of consulting engineer charges, and sample agreements on cost-plus, percentage, and combination bases. The book closes with a code of ethics for engineers.

Minnesota

Minnesota Society of Professional Engineers, Robert J. Newbury, 619 Guardian Building, St. Paul 1, Minn. *Recommended Schedule of Minimum Fees for Professional Engineering Services and Surveying* (1958).
The society has developed this 8-page pamphlet in conjunction with the Minnesota Association of Consulting Engineers. It covers the scope of engineering services; basic fee percentages; a discussion of cost-plus, lump-sum, and per diem fees; surveying charges; abstracts from Minnesota statutes relating to engineers; and a code of ethics for engineers.

Nebraska

Nebraska Society of Professional Engineers, Wayne Wilson, P.O. Box 208, Omaha 7, Nebr. *Code of Practice for Professional Engineers* (1955) $0.25.
A 16-page folio, this publication has a code of ethics; commentary on legal requirements; basic fee schedule and discussion of the schedule; services included and not included; per diem, lump-sum, and advisory service charges; and legal fees.

New Jersey

New Jersey Society of Professional Engineers, Eugene H. Koenig, 86 E. State St., Trenton 8, N.J. *Manual of Professional Practice* (1957) $1.00.
The 16-page manual includes a discussion of the manual's objectives; fees and charges; lump-sum, retainer, and surveying fees; the fee schedule plus a classification of engineering work, and three charts of fee percentages. The book concludes with a code of ethics.
Manual of Interprofessional Practice (1957) $0.50.
Ten pages cover fees for architects and engineers; a code of ethics; and discussions on professional license agreements, electrical and mechanical engineering services, additional charges, and a reciprocal rate schedule suggestion.

New Mexico

New Mexico Society of Professional Engineers, E. A. Roberts, P.O. Box 457, Carlsbad, N. M. *Recommended Schedule of Minimum Fees for Professional Engineering Services* (1948).
A single sheet shows types of construction and fee schedules for each type.

New York

New York Association of Consulting Engineers, Samuel Bogen, 144 E. 30th St., New York 16, N.Y. *Handbook* (1955).
A 48-page booklet, this publication includes the constitution and bylaws of the association; a code of professional practice; schedule of fees for structural, mechanical, and electrical engineering – including per diem, fixed, percentage, and cost-plus fees, and reimbursible expenses; standard owner-engineer and architect-engineer agreement forms;

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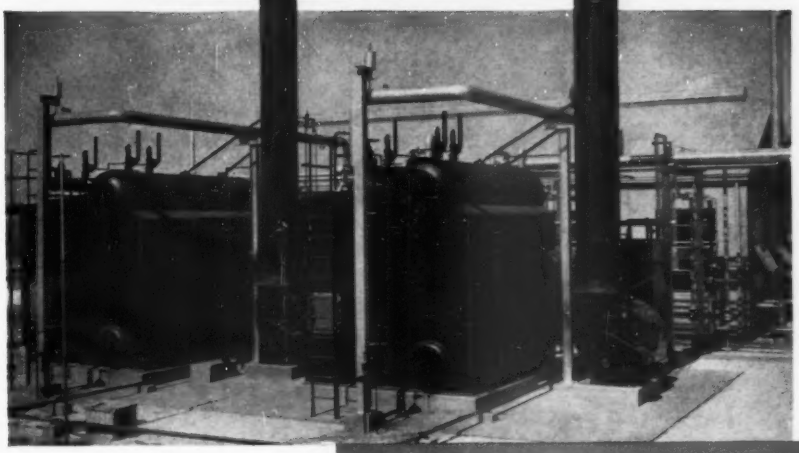
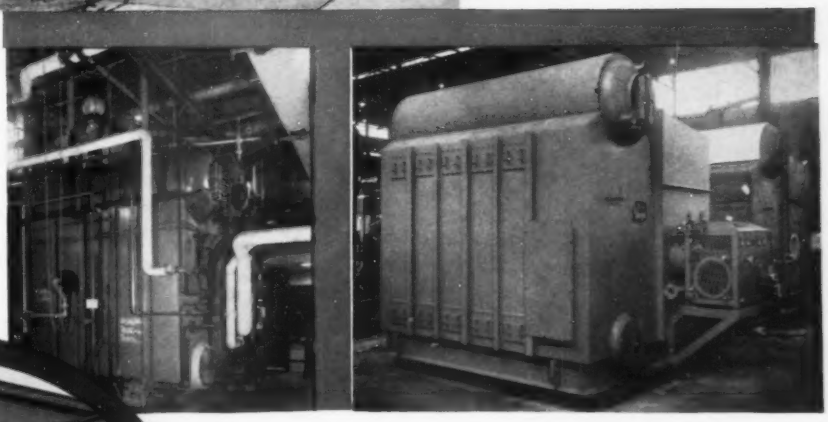
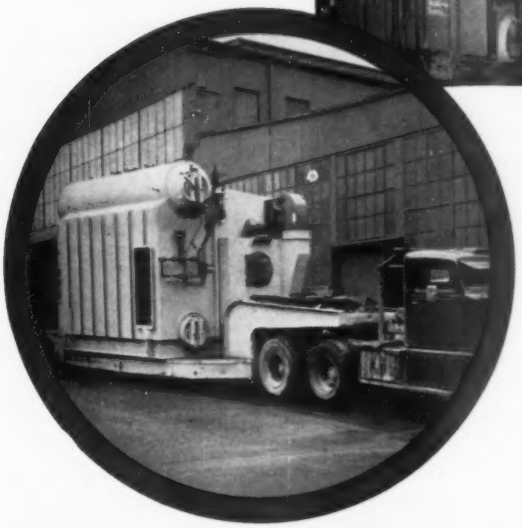




Above: Two units serve a gas pipeline company.

Left: Installation in fibre box-board plant.

Right: Unit for a leading soap manufacturer.



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and a list of association past presidents and member firms.

New York State Society of Professional Engineers, Harold H. Funk, 1941 Grand Central Terminal, New York 17, N.Y. *Schedule of Minimum Fees and Salaries* (1951).
The 12 pages of this text include an argument against low fees, a discussion of minimum fees plus a schedule of such minimums, suggested minimum salaries, and a roster of society chapters.

North Dakota

North Dakota Consulting Engineers Council, Kenneth O. Tompt, 415 Universal Building, Fargo, N.D.
Fee schedule and manual of practice will be published this year.

Ohio

Ohio Society of Professional Engineers, Lloyd E. Chacey, 5 East Long St., Columbus, Ohio. *Code of Professional Practice* (1954) $2.00.
The 28 pages have a discussion and schedule of minimum fees for general engineering, building construction and equipment engineering, and electric design and construction, plus explanations and suggested minimums for per diem, lump-sum, and legal fees. The booklet also contains owner-engineer agreement forms, canons of ethics, and rules of ethical practices, along with legal opinions from various Ohio attorneys-general and the Ohio supreme court.

Oklahoma

Oklahoma Society of Professional Engineers, M. A. Woodbury, 410 Commerce Exchange Building, Oklahoma City 2, Okla. *Schedule of Recommended Minimum Engineering Fees and Salaries* (1955).
The 22 pages contain the fee schedule and explanation of fees for general, mechanical, electrical, and structural engineering with a discussion and recommended minimums for per diem, legal, extra service, and lump-sum fees. Also included are suggested owner-engineer agreement forms, recommended salary schedule for engineers and assistants, along with duties and requirements for each classification, and a code of ethics.

Oregon

Consulting Engineers Association of Oregon, Rowland S. Rose, 615 Builders Exchange Building, Portland 4, Ore.
Fee schedule in preparation.

Pennsylvania

Pennsylvania Society of Professional Engineers, John T. West, 2121 North Second St., Harrisburg, Pa. *Suggested Minimum Engineering and Surveying Fees and Salaries* (1953) $1.00.
In its 28 pages the booklet covers minimum engineering fees based on a percentage of the work cost; suggested fees for special work, including per diem, cost-plus, contingent, and lump-sum engineering; and services included and excluded. A section includes information on salaries, duties, responsibilities, and qualifications of engineers and engineering aides; a discussion of surveying fees and salaries; and a code of ethics. This publication is being revised.

Texas

Texas Association of Consulting Engineers, Joe J. Nagler, 4512 North Central Expressway, Dallas 6, Texas. *Recommended Schedule of Minimum Fees for Structural Engineering* (1957).
A 2-page pamphlet has material on structural engineering for architects or other engineers, including a discussion of fees, services, lump-sum, per diem and cost-plus arrangements, and fee schedules. *Recommended Schedule for Minimum Fees for Mechanical and Electrical Engineering* (1957).
Another 2-page pamphlet of the same type as the structural engineering pamphlet covers mechanical and electrical engineering.
A similar folder for structural engineering work for owners currently is being prepared.

Texas Society of Professional Engineers, Gus F. White, 403 Nash Building, Austin 1, Texas. *Guidebook on Engineering Fees and Salaries* (1952).
This 18-page booklet includes discussions of engineering practices; recommended fee schedules; services included and not included; lump-sum, cost-plus, and per diem fees; a similar section for architect-engineer arrangements; suggested contract provisions; and recommended salaries, duties, responsibilities, and qualifications for engineers and engineer assistants. This is being revised.

Washington

Washington Society of Professional Engineers, David M. Lombardo, 512 First Ave., North, Seattle 9, Wash. No fee schedule is available at present.

Wisconsin

Wisconsin Society of Professional Engineers, Henry A. Kallsen, 437 Berwyn Drive, Madison, Wis. *Classification Schedule for Professional Engineering Services* (1952) $0.35.
This 12-page folio includes a suggested fee percentage schedule and per diem rates; requirements and salaries for engineers-in-training and professional engineers; a code of ethics; and rules of ethical conduct for engineers. ▲▲

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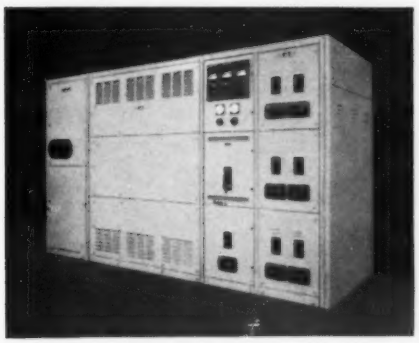

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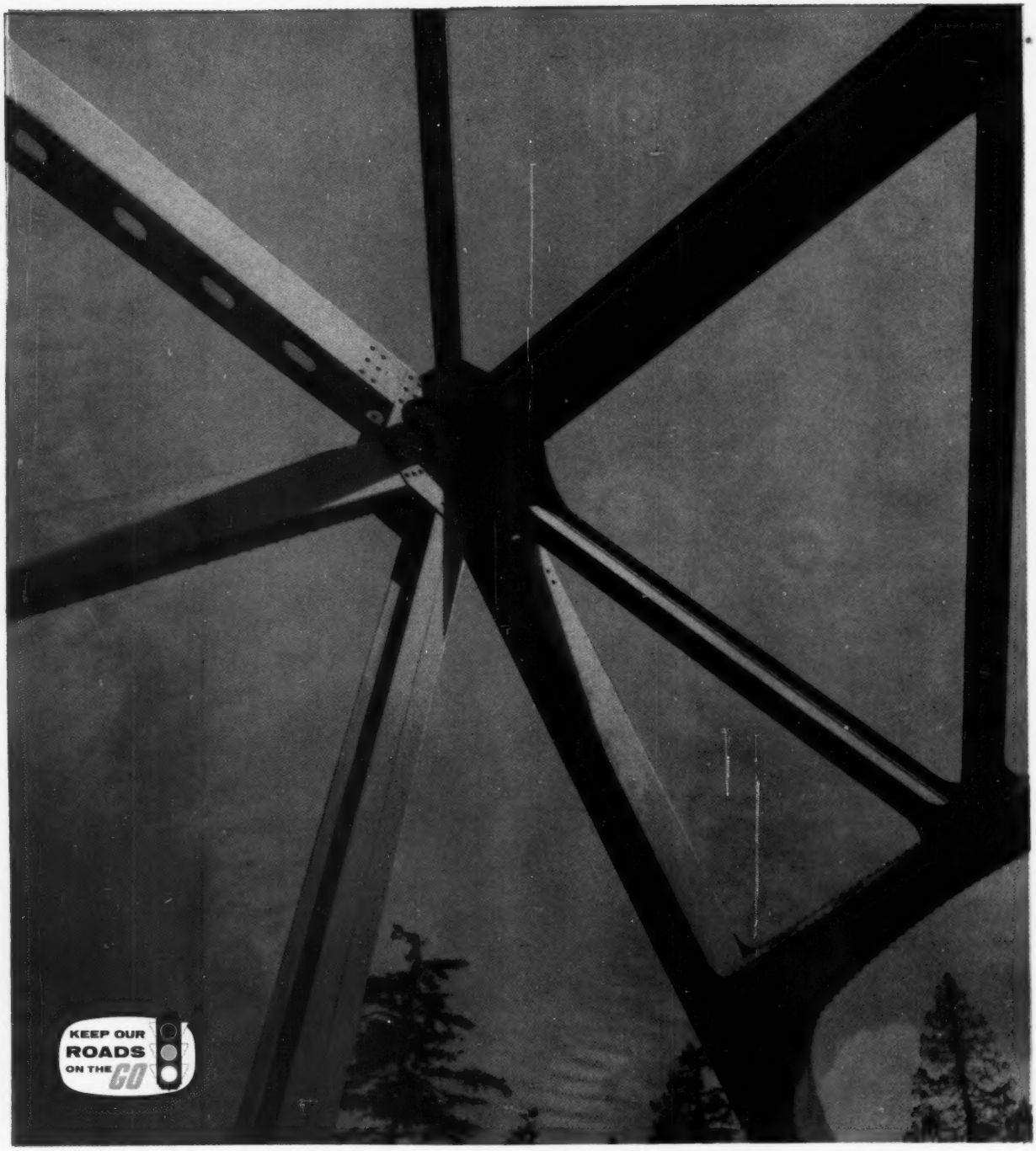

The 1,020′ Agate Pass Bridge is of through cantilever truss construction, built with 1,561 tons of steel. 650 tons are USS COR-TEN Steel, a high-strength low-alloy steel that eliminated 300 tons of dead weight and saved $87,000 in total steel costs.

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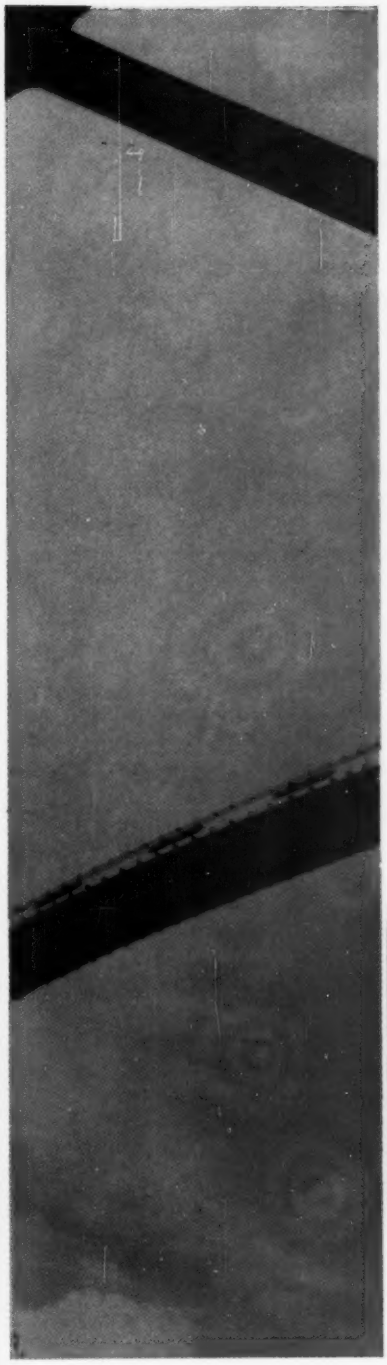

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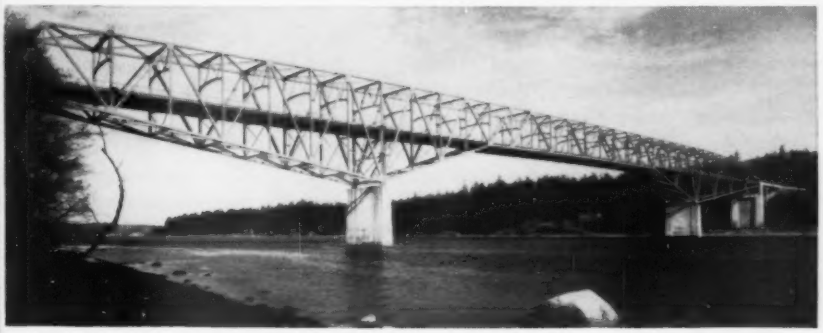

The Agate Pass Bridge • Owner: State of Washington • Designer: Department of Highways, State of Washington • Contractor: Manson Construction & Engineering Co. • Fabrication and Erection: American Bridge Division, United States Steel

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This is the Way Consulting Engineers Serve Private Clients

CONSULTING ENGINEER
STAFF REPORT

A REPORT FROM THE COMMITTEE OF ONE-HUNDRED. Why should the owner of a private enterprise owned project use a consulting engineer? Would it not be better for him to use his own central engineering staff: Might he not save money by leaving the engineering to a contractor or letting the manufacturers of equipment do the engineering "free"? If the consulting engineer has something extra to offer, what is it, and how does it benefit the client engaged in private enterprise?

These questions we put to our Committee of One-Hundred. Their answers give the facts that have to be explained every time a consultant is asked by a prospective client to justify the cost of his engineering work.

The Committee of One-Hundred is made up of prominent engineers from all parts of the country. They represent all sizes of firms and fields of specialization. This report is a composite of their thinking. It is not the opinion of any one man, but all of them will agree with most of it, and most will agree with all.

CE exclusive

WHEN DISCUSSING a proposed project with a prospective client, who is the owner or manager of some private enterprise, the consulting engineer often is asked to explain why he thinks he can do the job better at lower cost than the client's own central engineering staff. If the client's firm is a large one and he has in his employ a great many engineers of recognized ability, he even may be startled at the idea that the consultant considers himself superior to the company's staff engineers.

On the other hand, the owner of a medium size plant with a relatively small engineering staff may acknowledge the special talents of the consultant and realize that he does not have these talents available within his own organization. But he frequently feels that his own engineers can do a satisfactory job, and he is sure the cost would be much less.

Owners of small industrial plants readily acknowledge the need for outside engineering services, but they all too frequently are of the opinion that these services can be provided by contractors or by way of "free engineering" from manufacturers.

Better Projects for Less Money

It is up to the engineer to explain to these men, regardless of whether their organizations are large, medium, or small, that outside independent engineering services result in better projects at lower cost. The owner must be shown that design and supervision of new construction is a special type of engineering work. He should be made to understand that a good firm of engineers doing three to thirty major construction jobs every year can do better work at lower cost than equally competent engineers on the company staff who are called upon to design one new project every three to thirty years. The consulting engineer's organization is working on design, specification, and supervision of construction day after day, month after month.

The central engineering headquarters' staff is hired primarily for operation and maintenance work.

The consulting engineer, therefore, offers his private client a broader and more thorough experience on new project work than the client could possibly get from his own engineering employees. The fact that even the largest firms, General Motors, Ford, General Electric, and Westinghouse, make use of consulting engineers for the design of new industrial plants, power plants, and warehouses is indicative of the way in which consulting engineers can work even with the industrial giants.

Consultants Are a Bargain

Regardless of the size of the firm, it is difficult to have on the payroll enough competent men or enough different specialists to be able to properly handle the design and construction of large new facilities. And it is foolish to try to maintain an engineering staff year in and year out large enough to handle the peak engineering loads that occur only when a major expansion is undertaken. It is also poor policy to try to assemble a temporary engineering staff and turn it into a good, working team for a few months work, then lay off most of them as soon as the project is completed.

It is only good sense, no matter what the size of the firm, to secure the engineering help needed for major construction through the hiring of a consulting firm. This is not merely a matter of numbers. Even more important is the question of quality. It would be next to impossible for even the largest industrial firm to assemble and put to good use an engineering staff comparable in quality to that of even an average size engineering firm or the combination of several small engineering firms.

It has been established by a number of surveys that partners and principals of engineering firms have the highest income of any engineering group. No industrial firm could possibly justify salaries that would attract these men to their firms, then put their special talents fully to use only on those rare occasions when major new projects are to be undertaken. Yet the services of these men and their specialized assistants can be had for a particular project at less than the actual cost of maintaining a staff of employee engineers.

Good engineering is a matter of talent, not numbers, and it is better to engage the services of an expensive, experienced man for the period he is needed rather than to try to keep him on the permanent payroll.

It is important for the consulting engineer, when dealing with a prospective client who has a good central engineering department, to avoid any implication that he is a better engineer than those on the company's staff. That is not the point. It is that he is more qualified in his own particular field while the employee engineers are more qualified in theirs. It should be pointed out, however, that the consulting engineer can apply concentration to his projects that cannot be matched by engineers in the company's own plant. The consulting engineer does not have the distractions of day by day routine or the incidental problems that plague plant engineers.

The preparation of specifications and contract documents is everyday work for the consultant, yet these are unusual undertakings for the average central engineering staff. They not only can find themselves in financial trouble, but they also can get up to their necks in legal problems. It is also true that company engineers seldom are accustomed to dealing with contractors or with construction blueprints. And the consulting engineer's specifications are designed to secure the most effective competitive bidding among contractors and manufacturers. It is experience in these special fields and talents aimed at these particular aspects of engineering that make the consulting engineer more efficient on the type of work in which he specializes. There is no reason to believe that consulting engineers in general are any better technical men than their counterparts in industry, and this should never be implied.

Consulting Engineers Are Impartial

There also are other important points that the consulting engineer can emphasize when he is talking to a prospective client. He should explain to the client that the consulting engineer generally works in a fairly narrow engineering field (construction) and it is only natural that he should know of the latest technical developments. He is in close contact with manufacturers and suppliers of construction materials and equipment. Perhaps even more important, the engineer is an independent professional man and he is not under any kind of pressure that would cause him to specify any particular manufacturer's equipment or any particular supplier's materials. The consultant is not held in check by any company policies, and he is not in the least interested in what kind of equipment the owner's cousin is selling.

This independence can be of great value to the client. For example, it is well known that most business men like to deal with their own customers when they are in the market for new equipment. A manufacturer of electric motors has every reason to buy air conditioning equipment for his new plant from a manufacturer who uses his rather than a competitor's motor on the refrigerant compressor. Yet the customer's air conditioner might not be suited to the special needs of the new plant. If the job is being designed by the central engineer-

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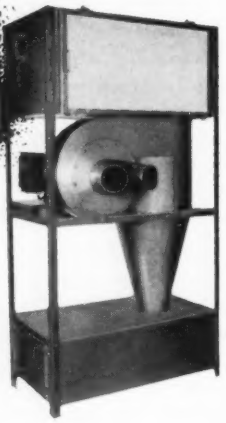

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ing headquarters, there is not much that can be done other than use the customer's product, suitable or not. But if a consulting engineer is doing the specifying, he is under no obligation to choose any equipment except that best for the job.

The consultant has taken his client off an uncomfortable hook and saved him time and trouble. This kind of business pressure is applied time after time even on relatively small construction jobs, and unless the owner has a consultant to take responsibility for the specifications, he can be forced into expensive purchases that detract rather than add to the value of the new plant.

Fresh Approach Invaluable

The consultant also should point out to the prospective client the value of a fresh approach. No matter how intelligent and well trained an employee engineer may be, if he has been working in one plant and under one management for years, he will find it difficult to look at a project objectively. The consultant is not so handicapped. For him the project is not in any way tied to past production or maintenance practices. While this lack of familarity with past procedure may have its difficulties, some of the consultant's new ideas are frequently of practical value. The plant engineer can reject those that do not suit his conditions.

This advantage of the consulting engineer is illustrated by a policy once established by the A&P Tea Co. This firm never selected area superintendents from among their store managers. It was felt that a store manager knew too much about what could *not* be done. The superintendents were not burdened with this negative knowledge. As a result they often set out to do things that could not be done – and then did them. Similarly, the consulting engineer is ignorant of things that "cannot be done" in certain industries. His fresh approach accomplishes the impossible.

Experience has shown that there is another way in which the consulting engineer saves money for industrial plants. It is strange, but often the owner is the last man to understand the need to provide for further plant expansion. When he has sold himself or is finally driven into expansion of his plant, he tends to look upon the new addition as the last that he will ever need. The consulting engineer, an outsider with an objective viewpoint, has saved many an owner a great deal of money by making future expansion easier despite the owner's positive opinion that the new plant will be big enough for not only his own lifetime but that of his grandchildren.

The consulting engineer carries what he learns on one project over onto the next. In building a paper mill, for example, he may make use of ideas

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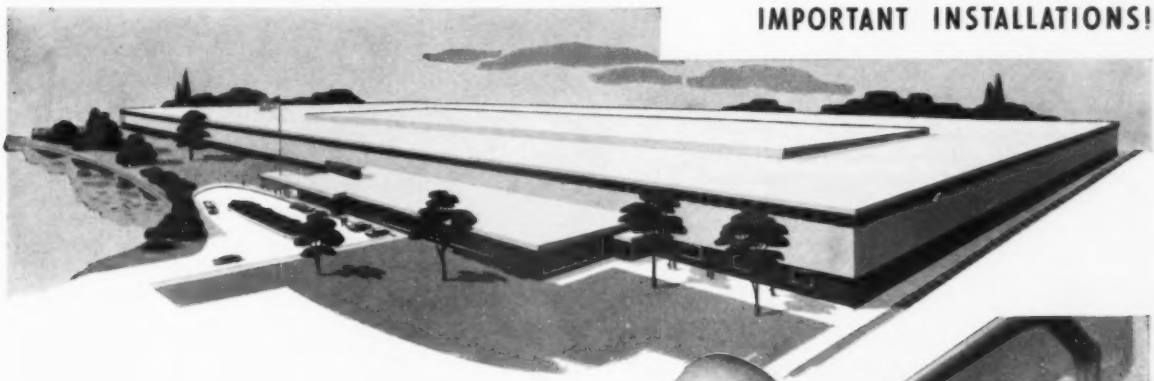
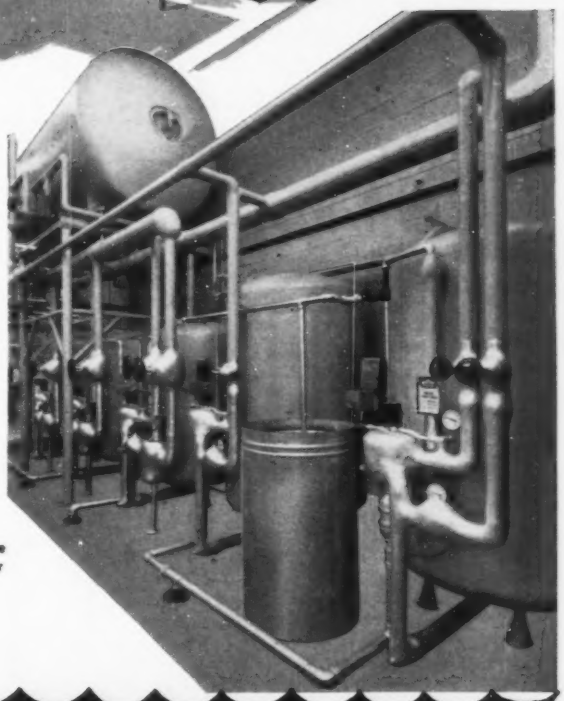


Pictured above is exterior view of giant new Square D Co. plant in Glendale, Wis. This huge industrial facility required installation of three Bruner fully automatic water softeners with a total capacity of 1,440,000 grains and two fully automatic iron filters with regenerant tank (photo at right).

Consulting Engineer: L. R. Schmaus Co., Inc., Milwaukee, Wis.

Architect: Grassold-Johnson & Associates, Milwaukee, Wis.

Plumbing Contractor: Paul J. Grunau Co., Milwaukee, Wis.



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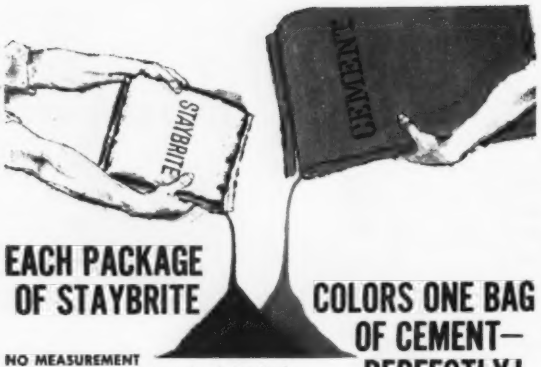

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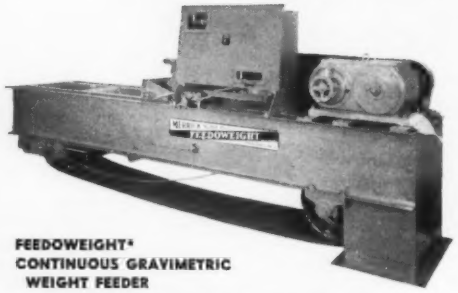

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learned while constructing a plastics plant. The paper mill staff engineer would never have had the opportunity to find out about design of a plastic plant, and even if he had, he might not have seen the possibility for application to his own industry. In this way the consulting engineer is a great disseminator of engineering information.

Consultants Don't "Tattle"

Sometimes this frightens rather than attracts a client. In some of the highly competitive industries making widely advertised products, the client is afraid that the consulting engineer working around his plant might have one of his competitors as his next client. The consultant must reassure his prospective client in this regard and explain that he fully understands his ethical responsibilities. On the other hand, there are very few industries these days that have highly valued trade secrets. They scarcely exist. Most of the superior qualities of the thoroughly advertised products such as soap and tobacco are discovered in the advertising agency rather than produced in the plant. Furthermore, there is much greater danger of losing any secrets that do exist through migration of employees than through a consulting engineer. The consultant always wants to be hired again on the next project, while the departing employee usually is gone for good and frequently is disgruntled.

Specialization is Not Cheap

A great amount of money is wasted in industry by trying to train staff engineers for specialized jobs they will be called upon to perform but once or at most, twice. A large west coast aircraft company recently completed a major lighting installation in one of their plants. They assigned their electrical engineer to the project, and while undoubtedly a competent man, he was not, and had no reason to be, an expert in lighting layout. He had to make a study lasting several months to become an expert in modern plant lighting. He also conducted a long series of tests on lighting equipment produced by several different manufacturers. While it is true that he came through with an excellent installation, the same system could have been specified by a consultant who was already familiar with lighting practice and who would not have had to spend time in becoming an expert or in testing equipment with which he was already familiar. The design cost of the installation obviously would have been reduced greatly by the use of the services of the consultant as compared to the training of an employee in a specialty outside his regular activities.

Unfortunately, too many industries do not realize the cost of training employees for special jobs. They seem to have the feeling that there is no cost

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Other Famous Showplaces Using Powers Air-Conditioning Control

Madison Square Garden • Radio City Music Hall • UN General Assembly Hall Coliseums in Houston and Syracuse

(c76)

Another Famous Showplace Equipped with

POWERS

Control Systems for Heating Ventilating and Air Conditioning

Versatility of Powers Control meets the varied needs of this unique building. A million visitors and exhibitors annually will enjoy its air-conditioned comfort.

Ten cooling towers on the Coliseum roof provide condenser cooling water for 4100 tons of refrigeration. Four centrifugal compressors carry the cooling load. Interconnection of the cooling and chilled water circuits permits compressors to serve either the offices or Coliseum.

The large Coliseum areas are supplied by high velocity single zone air systems while the small meeting rooms, office areas, etc. are served by low pressure fan units and by high velocity double duct systems. One of the 7 Powers Control panels is shown above.

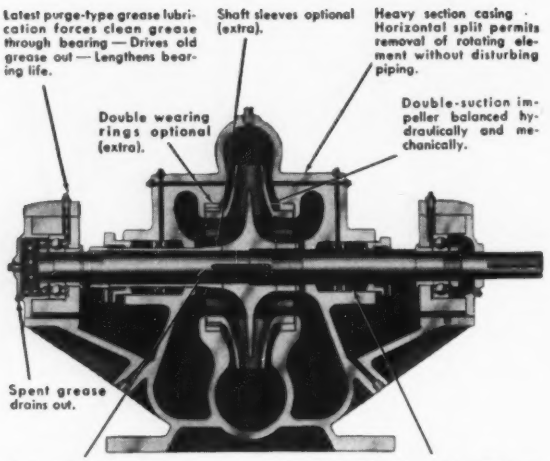
In the office building, occupants can dial the temperature they wish. Individual space control is obtained with 550 Powers Heating-Cooling Thermostats regulating 1400 unit air-conditioner valves. Interior zones are served by high velocity air systems.

Consult Powers when you have a temperature or humidity control problem for a new or existing building. You can benefit from our 65 years of experience gained in all types of buildings.

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A., Canada and Mexico*
See your phone book

65 years of Automatic Temperature and Humidity Control

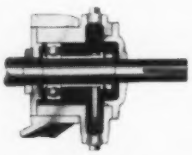

Latest purge-type grease lubrication forces clean grease through bearing — Drives old grease out — Lengthens bearing life.
Shaft sleeves optional (extra).
Heavy section casing · Horizontal split permits removal of rotating element without disturbing piping.
Double wearing rings optional (extra).
Double-suction impeller balanced hydraulically and mechanically.
Spent grease drains out.
Stainless steel shaft without sleeves is standard.
Extra-deep stuffing boxes take either conventional packing or mechanical seals.

New Purge-type Grease Lubrication

CUTS PUMPING COSTS

on American-Marsh Type HLM and HIM Split Case Centrifugals

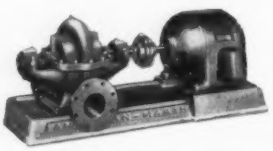
What does Purge-type Grease Lubrication offer you? Just this: By pushing out spent or dirty grease every time bearing is lubricated, it adds years of extra bearing service. That means less maintenance and longer pumping service from your total investment.



Ring-oiling ball bearings are also available (optional).

Many other superbly engineered features combine to eliminate interruptions and cut costs for A-M owners. Study the drawing a moment — You'll notice extra deep stuffing boxes and other details that are better designed, better built than ordinary pumps.

Then write for new HLM-HIM Bulletin 350, with full details and performance data.



HLM and HIM pumps are famous for low-cost service.

Pumps and Pumps only Since 1873

AMERICAN-MARSH PUMPS

BATTLE CREEK MICHIGAN

CENTRIFUGAL, TURBINE, STEAM AND POWER PUMPS FOR TESTING, PROCESSING, BOILER FEED, FIRE PROTECTION, ETC

involved in this type of undertaking for "we are paying the employees anyway."

Professional Salesmanship

Since only about 5 percent of the engineers in this country are with firms in private practice, it is clear that consulting engineers are not doing all the work that they might be doing. They have not thoroughly sold the value of their services; they have not educated all the prospective clients concerning the advantages to be gained through the use of engineering services secured on a fee basis. But if all of these advantages exist, how can the consulting engineer best explain them to his prospective client?

There does not seem to be any magic formula. Regardless of what professional terms the engineer selects to describe his method of convincing prospective clients, it is still salesmanship. It is up to the consultant when he meets with the client to point out to him all of the advantages.

It is also wise to get the prospective client out of his own office and into the office of the engineering firm. There the client can be impressed with the atmosphere of a firm that concentrates entirely on engineering. He can see the society membership and registration certificates on the walls. He can examine drawings and photographs of previous projects. He also can be shown copies of papers written by the engineer and shown any special awards the engineer has won in fields that are pertinent to the project. Under these conditions it is likely that the client will recognize the efficiency and the ability of the group. He can see then that his once-a-decade expansion is everyday work for the consultant.

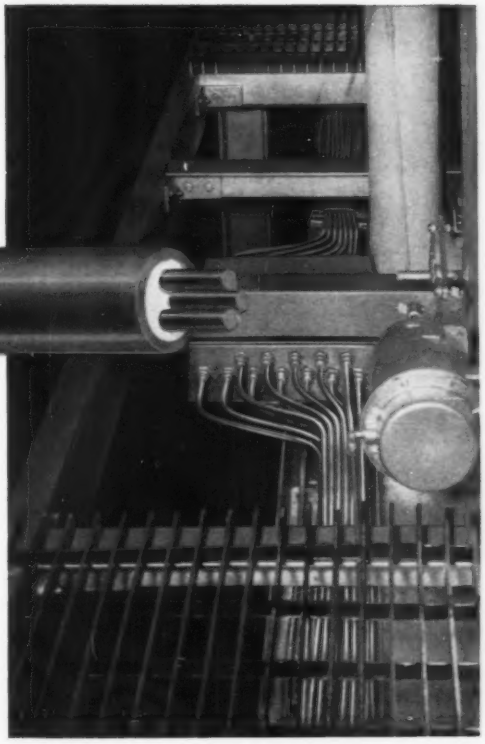
A recent and successful project is the best sales tool a consulting engineer has. It is a good idea for the consulting engineer to take the prospective client to visit one or two completed projects and perhaps one or two that are in the construction stage. The client will have an opportunity to talk with other businessmen who have made use of the consultant's services. He can talk with contractors on the job and staff engineers in the new plants.

Many of the reports of the members of the Committee of One-Hundred pointed out that it is often necessary to sell others besides the owner of the company. Most important of all is the plant engineer and his staff. Not only do they need to be sold, but once they are sold, they turn into good sales assistants for the consultant. Since the employment of a consulting engineer is actually much to the staff engineer's advantage, he should not be too hard to sell. It should be pointed out to him that he can continue to handle operation and maintenance.

The consulting engineer also can show the staff engineer how he can be of real help to him. For

SAFETY M.I. CABLE

the answer to industrial power wiring...



- SPACE SAVING
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- Permanent
- INSTALLED EASILY
- Fast power wiring to cut down-time

More and more General Cable's Safety MI 600 Volt Wiring System is being used because it can take the abuse of industrial application, giving trouble-free operation and unexcelled performance under the most severe conditions. Particularly adaptable in hot and wet locations. Available in 1, 2, 3, 4 and 7 conductor for power and control circuits.

MI terminating in main Japan Oven control center switchboard at Painsett Lumber and Manufacturing Company, Anderson, S.C.

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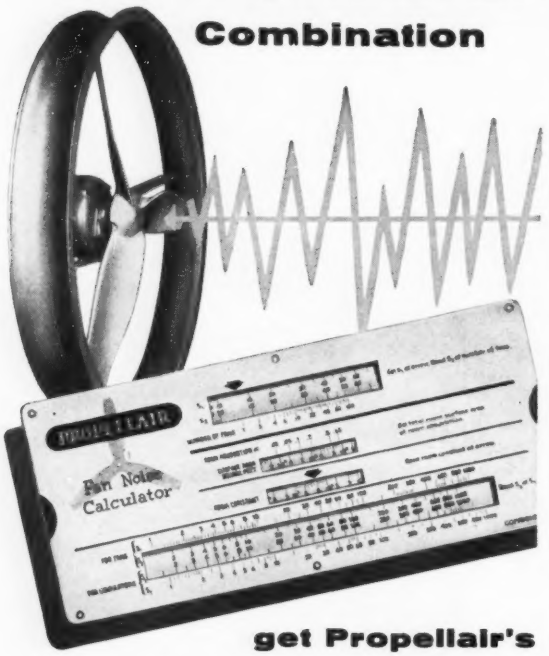
for quality and service...specify GENERAL CABLE

New! Simple Slide Rule Accurately Specifies Quietest Fan Combination



get Propellair's new Fan-Noise Calculator

The Fan-Noise Calculator permits prediction of resultant noise that one or more fans will make in rooms of any particular dimensions, construction and accoustical treatment.

Propellair's sone rating system for fans is simple and easily understood. It's based on frequency spectrum noise analysis plotted against the actual effect on the human ear. The sone system is far superior to inaccurate and improperly used decibel ratings . . . permits realistic direct noise comparisons (ten sones are twice as loud as five sones, etc.).

Now you can specify the quietest fan combination your room requires. Order your Fan-Noise slide rule calculator today! Send $1.00, with your name and address, to Propellair Division, Dept. CE, Robbins & Myers, Inc., Springfield, Ohio.

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example, an outside consultant often carries great weight with top management, and he can help the staff engineer put through some of his good ideas that up until that time have been turned down. The staff engineer will appreciate having the weight of independent advice on his side. In other words, the staff engineer and the consultant can be mutually helpful to each other, and in the process, helpful to the client. The wise consultant knows that good relations with the staff engineers are most important to the success of his project. His only more important function is properly to serve the client.

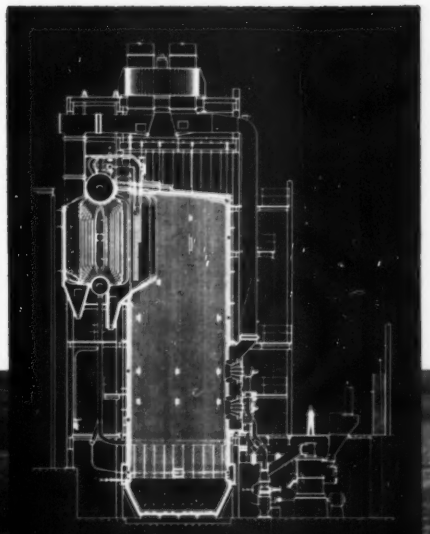
Sales Approaches

The face to face sales approach is the best, and there is no substitute. But every good salesman knows that he has to have written material to back up his story. This means that the consulting engineer should leave with the prospect a well-put-together brochure describing his firm and giving examples of some of its work. Then the client can refer to this material, and it will remind him of the salient points the consulting engineer outlined in his verbal presentation.

Group activity provides another sales aid. A number of engineering societies and associations, particularly state or regional groups of consulting engineers, have publications that sum up the advantages to be gained through the use of a consultant. These brochures can be a part of the written presentation. The fact that they sell professional services in general gives them an objectivity that is often effective.

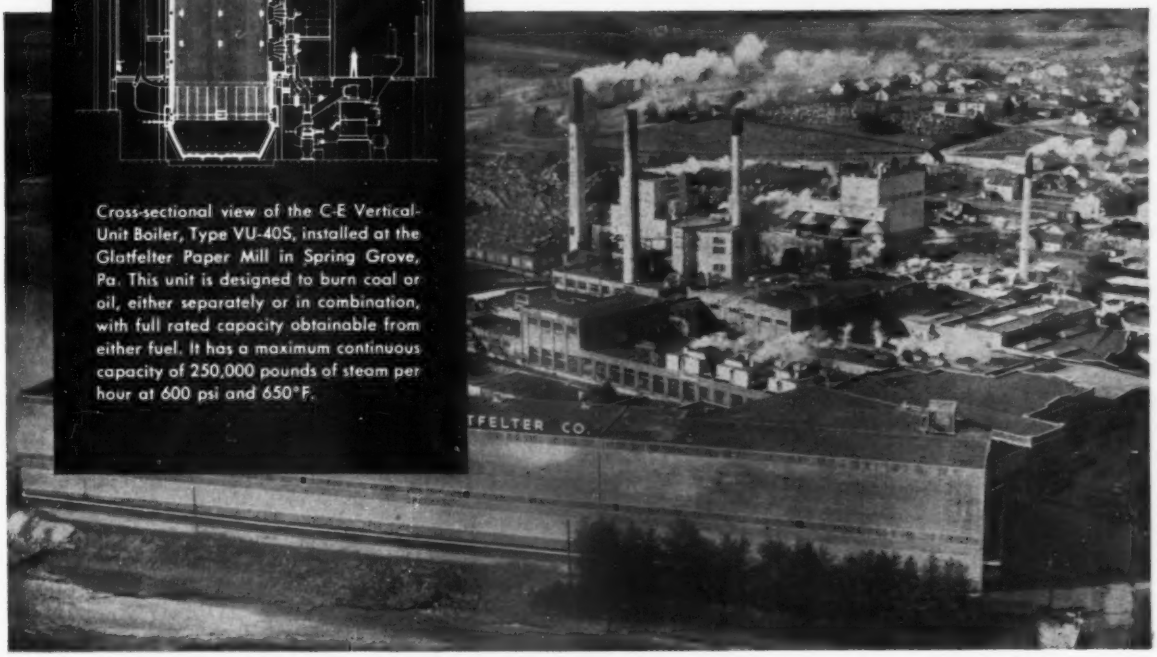
A good salesman always has something specific to sell. General sales stories may be the basis for a presentation, but just one or two specific suggestions are often the actual convincers. For example, a new idea on piping layout, lighting, or heating, though small in relation to the entire project, may be just what is needed to prove that the use of a consultant actually would result in a better job at lower cost. The savings might not amount to more than $10.00, but these savings are clear and can be demonstrated. They imply other savings that could develop as the project progresses. The client sees by example. If he already has some sketches or ideas, show him a few simple improvements. There is no need to argue – just suggest.

When the prospective client has been sold on the advantages of using a consulting engineer, it is still necessary to sell him on the selection of your own organization. This is a more difficult sales job, for the minute the engineer starts promoting his own firm instead of the whole profession, he runs into the danger of becoming involved in methods that are not ethically acceptable. Generally, it is safe to sell yourself by pointing to your own ac-



Cross-sectional view of the C-E Vertical-Unit Boiler, Type VU-40S, installed at the Glatfelter Paper Mill in Spring Grove, Pa. This unit is designed to burn coal or oil, either separately or in combination, with full rated capacity obtainable from either fuel. It has a maximum continuous capacity of 250,000 pounds of steam per hour at 600 psi and 650°F.

C-E BOILER "Makes a hit" AT NEW GLATFELTER PLANT



The recent start-up of this new paper mill marked the completion of the P. H. Glatfelter Company's largest expansion in its 93-year history. Included in this expansion was a new Fourdrinier paper machine, a 177-acre lake, and a C-E Vertical Unit Boiler. This new mill, which is in the best tradition of modern industrial architecture, has a potential capacity of over 300-tons daily.

Consulting Engineer tells why . . .

After completion of Acceptance and Peak Load Tests on a C-E Vertical-Unit Boiler, Type VU-40, at the P. H. Glatfelter Company's new Spring Grove, Pennsylvania, paper mill, The H. M. Wilson Company, Consulting Engineers of Philadelphia, commented as follows:

"Now, having determined the results of the tests, we are happy to advise you that the overall performance of the boiler was excellent, and we feel that this particular boiler is of outstanding design and construction. We have previously commented on the excellent cooperation of your Engineering Department in the design and development of this boiler, and can only reach the conclusion that your entire organization has been most cooperative and has done a fine job."

This opinion finds added significance in a statement by the company president, Mr. P. H. Glatfelter, III, who states, "We are well pleased with our choice of this C-E boiler for our new plant."

We, of course, are proud of this boiler, which, like the many other C-E installations of this and other types, is proving its superiority under actual operating conditions. When *you* need boilers, remember that Combustion Engineering has a complete line of steam generating and fuel burning equipment—a size and type that will meet your requirements exactly.

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C-E

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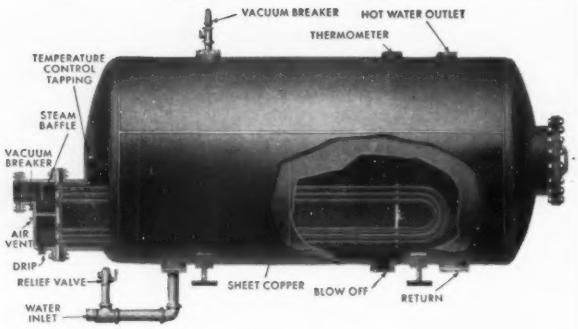

Sheet copper lined vessels are specified where life time service is a requisite. Therefore, it is of greatest importance that the "red metal" of proper quality be used, and that the fabrication be undertaken by people well grounded in its characteristics.

Here is why hundreds of Sims sheet copper lined vessels *continue to serve for over 25 years*—because lasting service requires:

1. All interior welds or rough areas must be *ground flush and smooth.* All sharp edges completely removed.
2. Sheet copper must be *forge formed* to steel shell and heads. Sheet copper must be spun into all openings or connections in the vessel.
3. Sheet copper must be stayed to shell and heads in a watertight manner providing the necessary reinforcement and expansion requirements.
4. The sheet copper lining must be air tight under twice the design working pressure. Tightness determined by tell-tale hole in steel shell.
5. The Sims ASME welded steel shell is hydraulically tested at twice its design pressure, and must meet insurance standards in all respects.
6. Sims procedure in sheet copper lined vessels is a time-tested design used for over 25 years to withstand any specified pressure or vacuum.

Write for a copy of our insert catalog in Domestic Engineering's 1958 Catalog Directory. It contains complete data including prices to help you specify Sims Hot Water Storage Heaters or Tanks.

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OIL HEATERS • QUENCHING OIL COOLERS • CAUSTIC SODA RECOVERY EQUIPMENT.

complishments. It is extremely unethical to sell yourself by disparaging the work of others. Also, the ethical engineer is extremely careful not to negotiate with a client while that client also is negotiating with another engineering firm.

Jobs the Consulting Engineer Can't Do

The members of the Committee of One-Hundred agree that there are projects on which the consulting engineer cannot do as good a job as the client's own engineering staff. When the project is small and of a standard or repetitious nature, there is little reason for calling in a consultant. It is hard to save the client the equivalent of the fee on a job involving only a few days' work and a few thousand dollars of construction cost. Even on large jobs where the design is merely a repetition of an older design, it may not pay to hire a consultant. A consultant saves the client money by improving a design or selecting better equipment.

There are other instances in which the consultant is better left out of the picture. In pure process work involving only the setting up of process equipment, the staff engineers usually are more qualified than an outside consultant. Then, too, there is again that problem of trade secrets. But, even tobacco, soap, and synthetic textile people have used consultants on process work from time to time and have been pleased with the results. These companies nearly always use consultants for actual new plant design and supervision of construction.

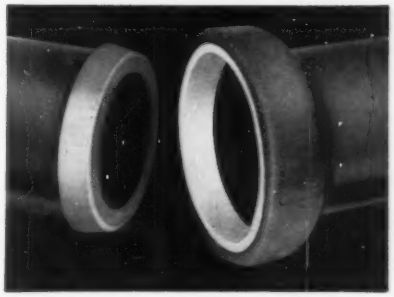
A central engineering staff usually can do long range planning and establish over-all objectives better than consultants from the outside. And in most industries there is a certain base load that staff engineers should be able to handle. In the most efficient companies, however, this base load is small, and the central engineering headquarters is held to a minimum number of men, all of whom have a full work load.

This resolves itself into the simple conclusion that staff engineers of a central engineering department can handle better any type of work that they do often – the repetitive maintenance and minor construction as well as routine operation. Similarly, the consulting engineer can handle better work of the type that he is accustomed to doing day by day.

The engineering work of telephone companies is typical of that that can be best handled by company engineers. This is a specialized type of engineering activity with which the telephone company engineers are more familiar than any one else. It is obvious that for a new telephone exchange, the building is a project that should be assigned to architects and consulting engineers, but the installation and hook-up of equipment can be more efficiently done by telephone company employee

you save money SEVEN WAYS with longer, stronger AMVIT Clay Pipe

Outstanding Mechanical Joint
on pipe 4 feet long or over
Available in 4" through 24" diameters



More than 200 major installations have been completed with outstanding results since Amvit Jointed Clay Pipe was introduced in 1955.

Such pioneer cities as Ann Arbor, Michigan, Dayton, Ohio, Camden, New Jersey have installed their second and third Amvit sanitary lines.

A mechanical joint designed for quick, low-cost installation, Amvit* will give you lower cost-in-place. Here's how:

1. QUICK INSTALLATION SAVES LABOR

No other materials such as caulking, joint compound, hot pots, or ladles are needed to make the Amvit joint. The joint is on the pipe delivered to the job ready for use. Just push the pipe together and the joint is complete.

2. IMMEDIATE BACKFILLING

You can backfill as soon as the line is completed. Barricades can be removed and streets opened days sooner.

3. QUICK TESTING

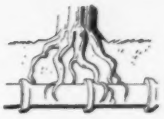
No need to wait days to see if a line has passed test. A look at the completed joint will tell. Thus, engineers can inspect and accept the line allowing the contractor to receive payment quicker.

4. CONTROLS INFILTRATION

Field tests from completed installations show that infiltration can be definitely controlled. Engineers can, thus, reduce infiltration specifications, use smaller diameter pipe and save in material cost.

5. ROOT PROOF

Amvit is a compression joint on the ball and socket principle. The surfaces of both bell and spigot are in uniform compression preventing root penetration.



6. BETTER FLOW, LESS MAINTENANCE

The design of the joint assures that the pipe is self-centered at all times. This gives perfect alignment and self-cleansing. Because the joint is really tight, no foreign matter such as dirt, sand and stones can possibly enter the line.

7. COMPLETE FITTINGS

Amvit is furnished on all standard fittings, as well as pipe. This will permit a uniformly tight line from house wall to treatment plant.

Amvit Jointed Clay Pipe, in sizes 4" through 24" together with all fittings is available for immediate delivery in the Northeast and Central States.

For more information on how Amvit can help cut your sewer project costs, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.

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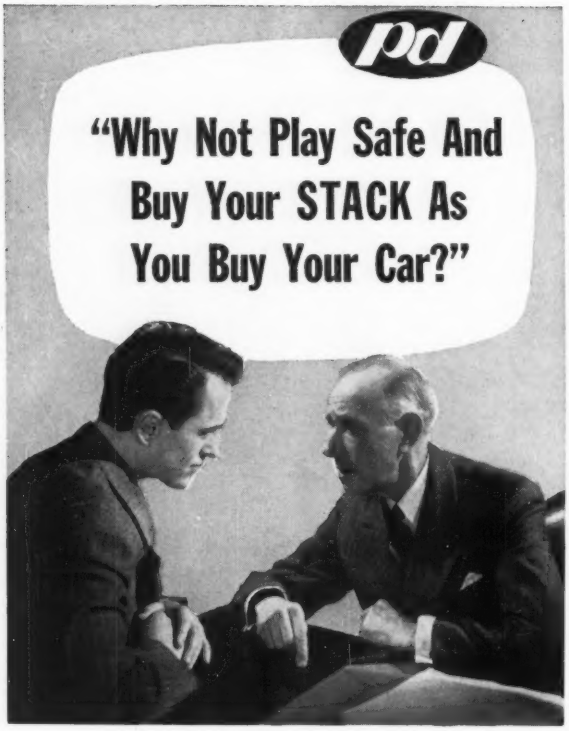


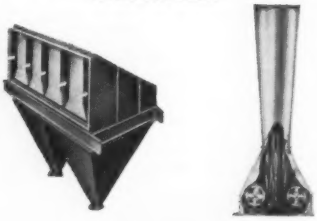
"Joe, you wouldn't buy the engine of your car from one manufacturer, the wheels from another and the body from still another, would you? Neither would I. And when I design for induced draft, I specify a P-D Stack because the I.D. Fan, though it is important, isn't the whole story. The combined breeching, stack and fan, built as ONE apparatus, gives me unit responsibility, compact design, simplified engineering, and positive performance, with a lot less purchasing details.

"Another thing, I'd rather buy my Dust Collector from the same manufacturer that made my Stack and Fan. For this is all part of the same system for handling the gas after it leaves my boiler unit.

"There's nothing like putting all the responsibility on ONE manufacturer's shoulders if you can, for then you'll come out on the long end nine times out of ten. Buying such equipment piece-meal is antiquated and costly."

You can save a lot of time, trouble and money by purchasing your Stack and Dust Collector from Prat-Daniel.

Write for data.



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engineers who are intimately familiar with the type of work involved.

At one time railroads also found it best to have most of their engineering done by employees, but there is now a trend toward using consultants, particularly for bridges, overpasses, and large buildings.

Pilot plant work often can be handled better by employee engineers. Here, plans change frequently from day to day, and they are closely tied in with the process methods with which the staff engineers are familiar.

New Fields for Consultants

Conversely, there are jobs now normally done by central engineering departments that could be improved by the occasional calling in of a consultant. More and more consulting engineers now are being used on a retainer fee basis for maintenance supervision. This does not mean that the consultant or a member of his staff is constantly on the job handling leaky pipes or replacing worn valve seats. It does mean that the consultant visits the plant from time to time and studies the methods used by the maintenance crews. Often he can find ways to improve maintenance methods that will save the company money. This same approach sometimes applies to plant operations. A study by a consultant may bring in new ideas that greatly improve production.

Few consulting engineers have done much work in product design, though there are some specialists in this field. More independent work of this type could be done. A company's own design engineers often are prone to overlook deficiencies in their own products and to exaggerate faults in competitive products. An independent engineer is not handicapped by this natural prejudice.

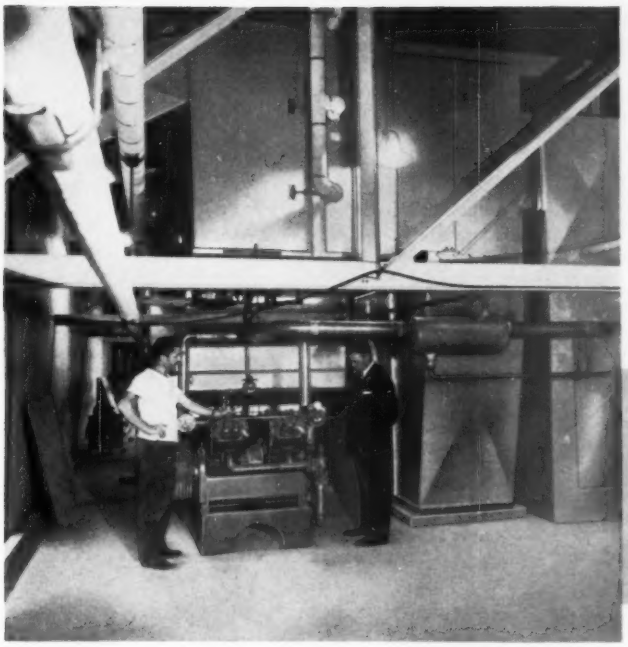
Consulting engineers also have found it to the client's advantage to prepare for him general operating and maintenance manuals. Manufacturers have done a good job with operation and maintenance manuals on their products, but the engineers running a plant need more than individual manuals for each piece of equipment. The consulting engineer can serve his client by preparing good manuals covering the combined functions of all the equipment and machinery in a particular department or in a whole plant. These manuals show how various pieces of equipment are dependent upon each other and the manuals treat the plant as a functioning unit. Consultants could do more of this work.

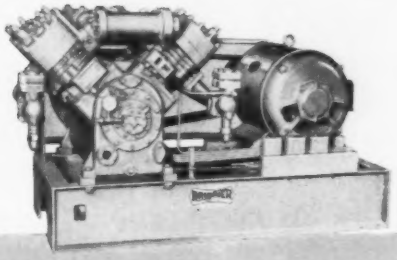
These are the ways in which the consulting engineer can serve his clients who are owners of industrial plants and other private enterprises. The next topic to be assigned to the Committee of One-Hundred will deal with the ways in which the consulting engineer can best serve public clients — Federal, state, and local. ▲▲

FOR THOSE BIG AIR CONDITIONING JOBS...

Compressors from the BIG BRUNNER LINE

BRUNNER SINCE 1906





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- MOUNTING BASES CONSTRUCTED OF STRUCTURAL STEEL.
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- FORCE FEED LUBRICATION.
- PRESSURE RELIEF SAFETY VALVE.
- MODULATION AND UNLOADED START (optional).

Typical of the BIG air conditioning jobs where architects, consulting engineers and contractors have learned to rely on BRUNNER compressors is the new Bostitch plant in East Greenwich, Rhode Island.

75 HP compressors, 100 HP compressors—whatever the size requirement—there was a Brunner unit to satisfy the design conditions.

Rugged workhorses of the various air conditioning systems at Bostitch, these units are tied-in to Dunham-Bush evaporative condensers and serve ceiling mounted air handling units for the Stapling, Engineering and Drafting departments. They also serve Dunham-Bush multizone units for conditioning executive offices and cafeteria areas.

Select Dunham-Bush and Brunner for *single source service and responsibility.*

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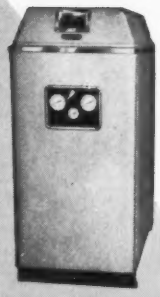
WITH AUTOMATIC CONTROL AND GREATER ACCURACY

Automate your metering, batching or blending operation with a Bowser liquid control SYSTEM . . . and get these BENEFITS . . . lower initial investment . . . completely automatic control . . . unsurpassed accuracy . . . increased efficiency . . . single source of supply . . . and system performance guaranteed by Bowser, Inc.

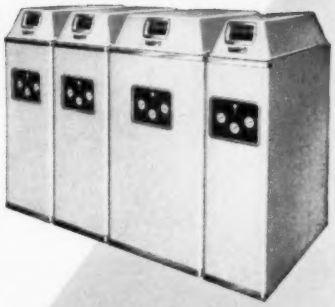


Rate of Flow Controlling System

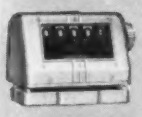
The Figure 417 Rate of Flow Controller is a completely self-contained system enabling fully automatic and accurate CONTROL of the rate of liquid in flow . . . to better than ¼ of 1% accuracy. Handles flow rates from ½ G.P.M. to 250 G.P.M.

Liquid Blending System

The Figure 413 Precision Blending System automatically and accurately blends two or more liquids in closed, continuous production. Accuracy within ¼ of 1% and completely automatic operation . . . assures uniform blend . . . reduces blending costs by 50%.

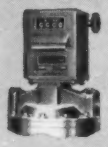


BOWSER METERS AND ACCESSORIES . . . offer complete systems for every type of liquid control requirement

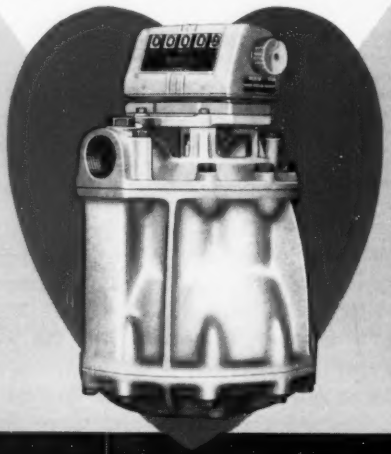


MODEL L . . . straight-reading dial records liquid metered up to 100,000 gallons.

IMPULSE TRANSMITTER . . . transmits electrical impulses to a remote counter which records quantities, controls automatic batching.



MODEL K . . . Printing Dial provides printed records of quantities metered for inventory control, etc.



MODEL F . . . relays voltage signal to a remote flow indicator or controller permitting remote observation and control of the flow rate.

MODEL RP . . . automatically delivers repeated predetermined quantities of liquids.

REMOTE PREDETERMINING COUNTER . . . records electrical impulses from meter permitting automatic delivery and shutoff control for predetermined quantities.

XACTO METER . . . the HEART of Bowser liquid handling systems

Mail to BOWSER, Inc.

1307 E. Creighton Ave., Fort Wayne, Indiana

Please send complete information illustrating the many types of Bowser systems available.

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

XACTO . . . meters assure precision accuracy. Available in bronze, iron and all stainless steel construction.

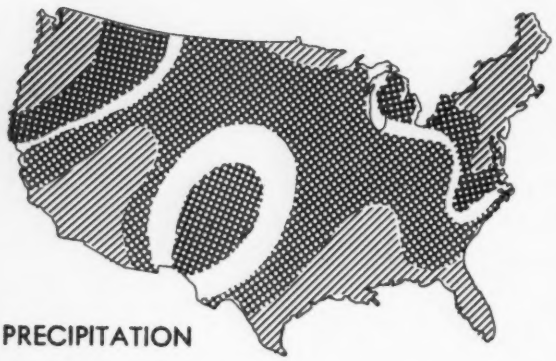
Bowser's full line of meters, accessories and controls combine to offer you today's most automatic, economical and modern liquid handling systems.

BOWSER ESTABLISHED 1885

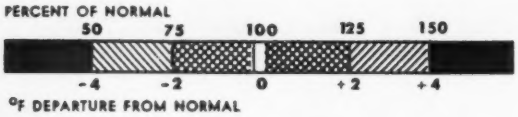
KRICK WEATHER OUTLOOK

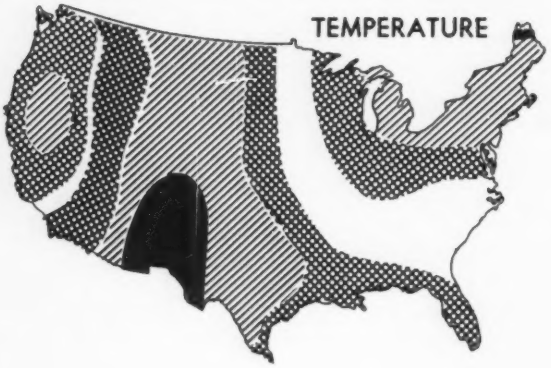
MAY 1958

Prepared Exclusively for CONSULTING ENGINEER

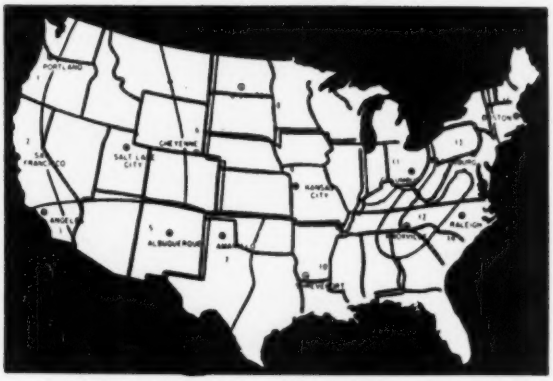


PRECIPITATION





TEMPERATURE



CONSTRUCTION DAY FORECAST LOCATIONS

CONSTRUCTION DAY CRITERIA

To be considered a construction day on these charts, the day's maximum temperature must be more than 38 degrees. There must be less than six inches of snow on the ground. There must be less than six hours of active precipitation between the hours of 7 a.m. and 5 p.m. There can be no more than one inch of rain on the preceding day.

MAY HIGHLIGHTS

The vast majority of the United States will be drier than normal during May, notable exceptions being northern portions of both coasts and the southern Great Plains. Heavy rains in the Central Atlantic and New England states will cut into operations there. Similar heavy moisture in southern Plains is not expected to seriously hamper construction, for normals in that region are extremely low and good weather is the rule, not the exception. Temperatures will be below normal throughout the northeast, dropping as much as four degrees below normal in New England. But no severely cold weather is expected as the normal seasonal heating will keep temperatures generally above freezing. Above normal temperatures in the southwest and through the Great Plains and Rockies should not seriously hamper outside work. Slightly cooler than normal temperatures through the Pacific Northwest will tend to keep conditions there quite comfortable during the usually muggy month of May. Dry, warm weather expected in the Southwest will not materially change normal conditions in this historically sunny area, although normal temperatures and drier than normal precipitation patterns in the southeast could be heavily in favor of construction in that normally rainy region. Over-all, better than average construction weather over the vast majority of the country will feature the month of May, 1958.

TEAR OUT ALONG PERFORATION.

These forecasts are prepared by Irving P. Krick Associates, Inc., the world's oldest and largest weather engineering firm. The forecasts are based on methods developed at California Institute of Technology prior to World War II. After the War, the methods were adapted to high speed electronic computing machines to shorten the time required to solve the complex problems of the atmosphere. Ultra-long range forecasts, up to a year or more in advance, are now available. Information on other Krick weather services is available by writing the home office at 460 South Broadway, Denver, Colorado.

CONSTRUCTION DAYS

MAY 1958 ESTIMATES															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	31	31	31	31	31	31	31	31	30	30	31	31	30	31	30
LOWEST	22	29	28	28	30	19	28	25	25	25	25	26	23	28	23
AVERAGE	28	30	31	29	31	27	29	29	28	27	28	28	26	30	26
ESTIMATE	26	30	31	31	30	30	28	30	28	29	27	28	25	29	24

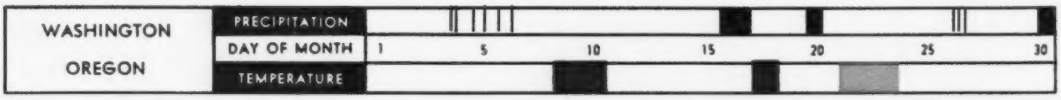
As usual, rainfall will be the dominant factor in the number of construction days during May — and the above estimates have taken into account the frequent and heavy rains expected in the Pacific northwest and in the northeastern third of the country. Although the number of construction days do not approach a record low anywhere, they will be well below the average in the northeast and northwest corners of the country. Frequent shower activity will cause several short term construction interruptions in the southern Plains. However, the fact that the majority of the country will be drier than normal is responsible for most localities to be estimated above the average number of construction days. The Great Basin and southeastern portions of the country show the greatest improvement over normal for the coming May. The fact that May will close on a warm, relatively storm-free note across the country should provide a running start for construction during June.

JUNE AVERAGE AND RANGE*															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
LOWEST	25	28	29	28	29	26	28	24	24	27	26	27	24	26	23
AVERAGE	28	29	30	29	30	28	29	27	27	29	28	28	27	28	26

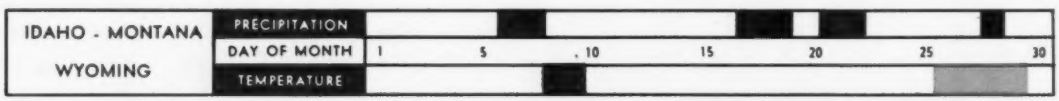
JULY AVERAGE AND RANGE*															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	31	31	31	31	31	31	31	31	31	31	31	30	31	31	30
LOWEST	30	29	31	30	29	27	29	28	23	28	26	26	25	24	26
AVERAGE	30	31	31	30	31	29	30	30	28	30	29	28	28	28	29

*Historical Average, Not a Forecast

MAY 1958 TIMING OF S

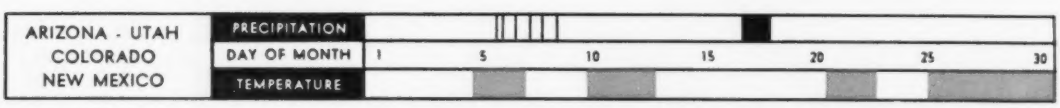


Indicated rain periods during first half of month will be mostly scattered showers. Indicated cold periods will be cool, not cold, and will be more important in inland areas. Temperatures during last ten days generally will be above normal.

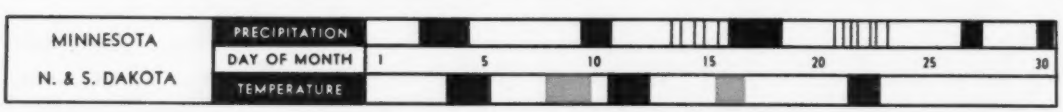


Most important rains of month will occur during period following the 5th. Other indicated rain periods will be mostly scattered shower activity. Indicated cool period is not extreme; warm period will send temperatures into 80's.

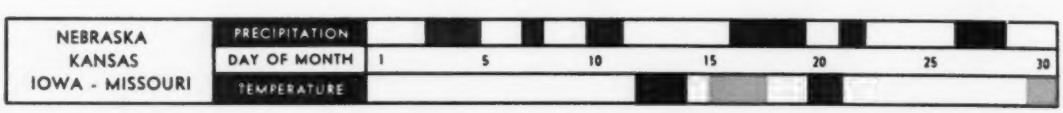
Indicated shower periods are important only in northern portions of California. Otherwise, stormy periods will be composed mostly of stratus and drizzle. Cool periods are not important; temperatures during warm periods will be in the 80's.



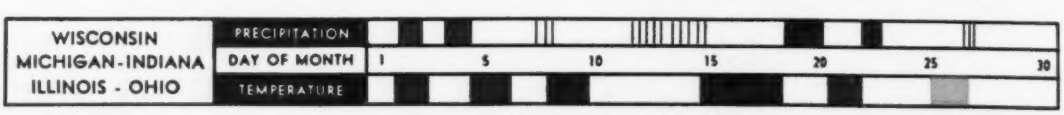
Indicated shower periods are general over the area. In addition, Utah and Colorado can expect showers around the 1st-3rd, 12th-14th, 22nd, and 30th of May. Temperatures will be above 100 in Arizona during month-end warm spell.



Heaviest precipitation during indicated rain and shower periods will fall in eastern Dakotas, Minnesota. Indicated storminess at mid-month will be mostly in the form of widely scattered showers.



Frequent showers will keep operational weather to a minimum in many parts of this area. Most prolonged showers will occur between the 16th and 20th, with mostly scattered shower activity during the last ten days. Cool outbreaks will not be extreme.

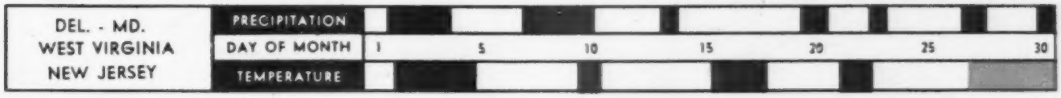


Most important rains will occur during period just prior to the 20th; otherwise most storminess will be in the form of widely scattered showers. Cool periods will not be extreme, but featured by low daytime maxima due to cloudiness.

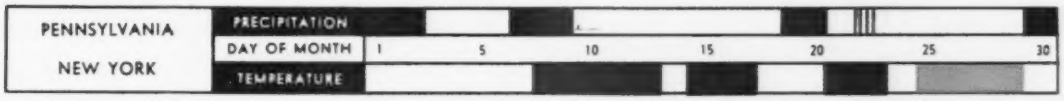
SIGNIFICANT WEATHER EVENTS

RAIN
SNOW
WARM
COLD

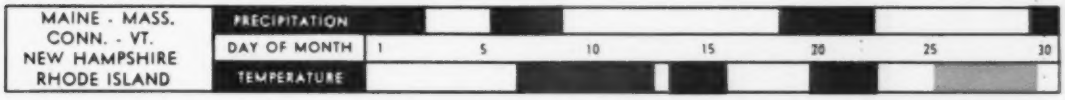
The timing bars below are intended to indicate periods of important general storminess and important departure from temperature normals in areas indicated. They are highly accurate over the area indicated, but are too general to pinpoint small local storminess or showers. Allow one day on either side of indicated storm or extreme temperature periods for general planning. Combination rain or snow shading indicates either one or both.



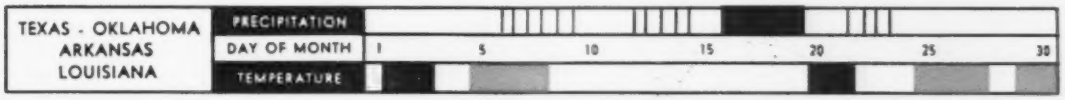
Indicated cool periods do not mean extremely cold temperatures; rather, they reflect below normal daytime maxima due to cloudiness. Most important rains will come during first half of month with mainly shower activity thereafter.



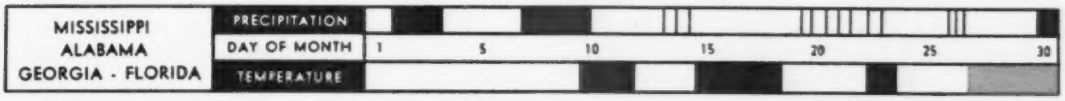
Frequent local showers, in addition to major precipitation periods above, will feature this area. Most prolonged general rains will come during first ten days of month. Cool periods are not extreme. Temperatures during month-end warm spell will go into 80's.



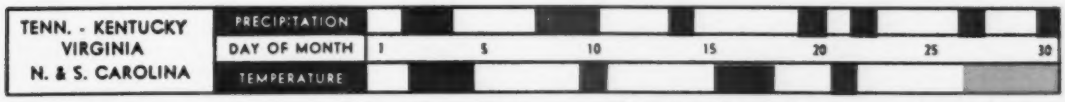
The prolonged outbreak of cool weather just prior to mid-month will find daytime temperatures on the cool side because of cloudiness but no severe overnight temperatures. Most important rains will occur during first ten days of month.



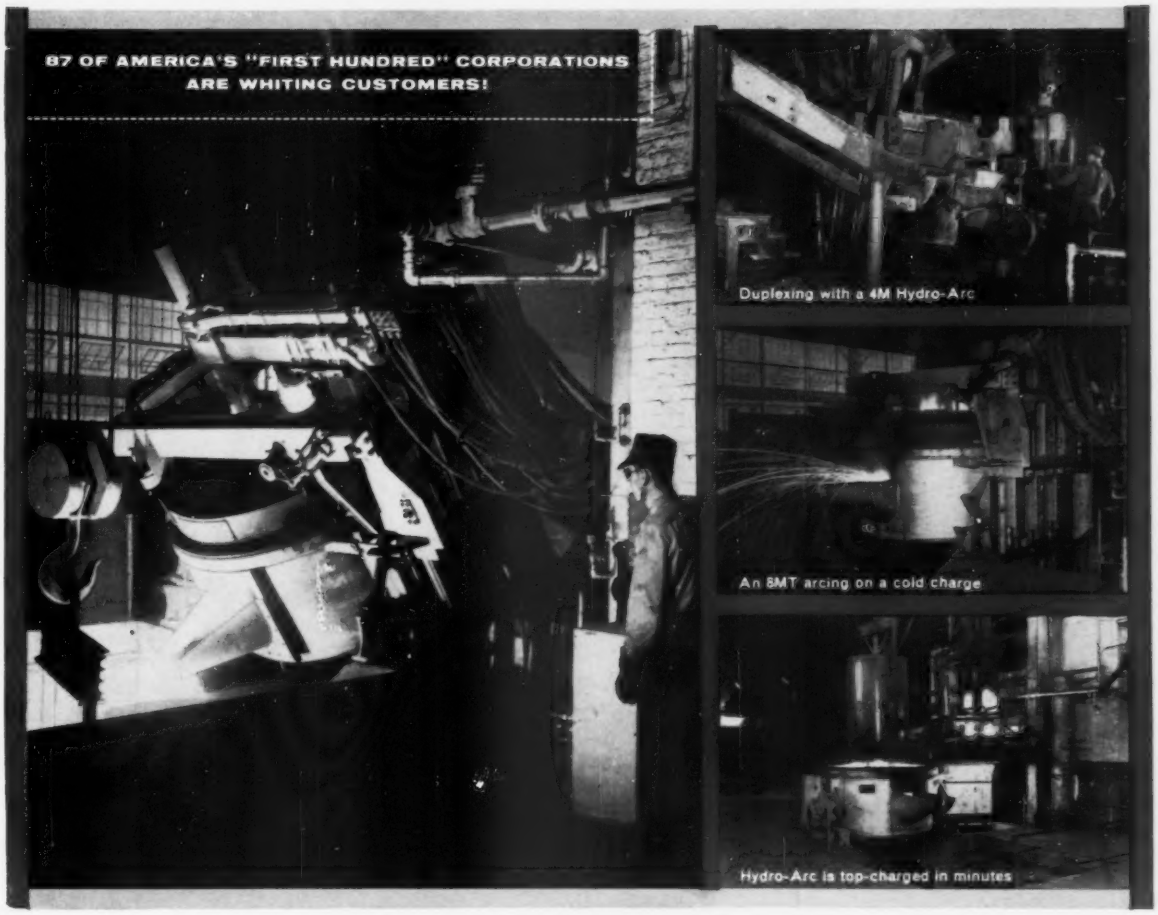
Area will be featured by frequent local shower activity, with storm period between the 16th and 20th providing the most general rains over the region. Neither the cool nor the warm spells indicated will be extreme.



Most of the rainfall for this region will occur during the two storm periods in the first ten days of the month. The remainder of the precipitation periods will produce mostly local shower activity. Cool outbreaks will not be extreme.



The frequency of showers in this region will be responsible for the indicated cool outbreaks, primarily due to cloudiness. No severe temperatures are expected. Best rains are in first half of month; mostly local showers thereafter.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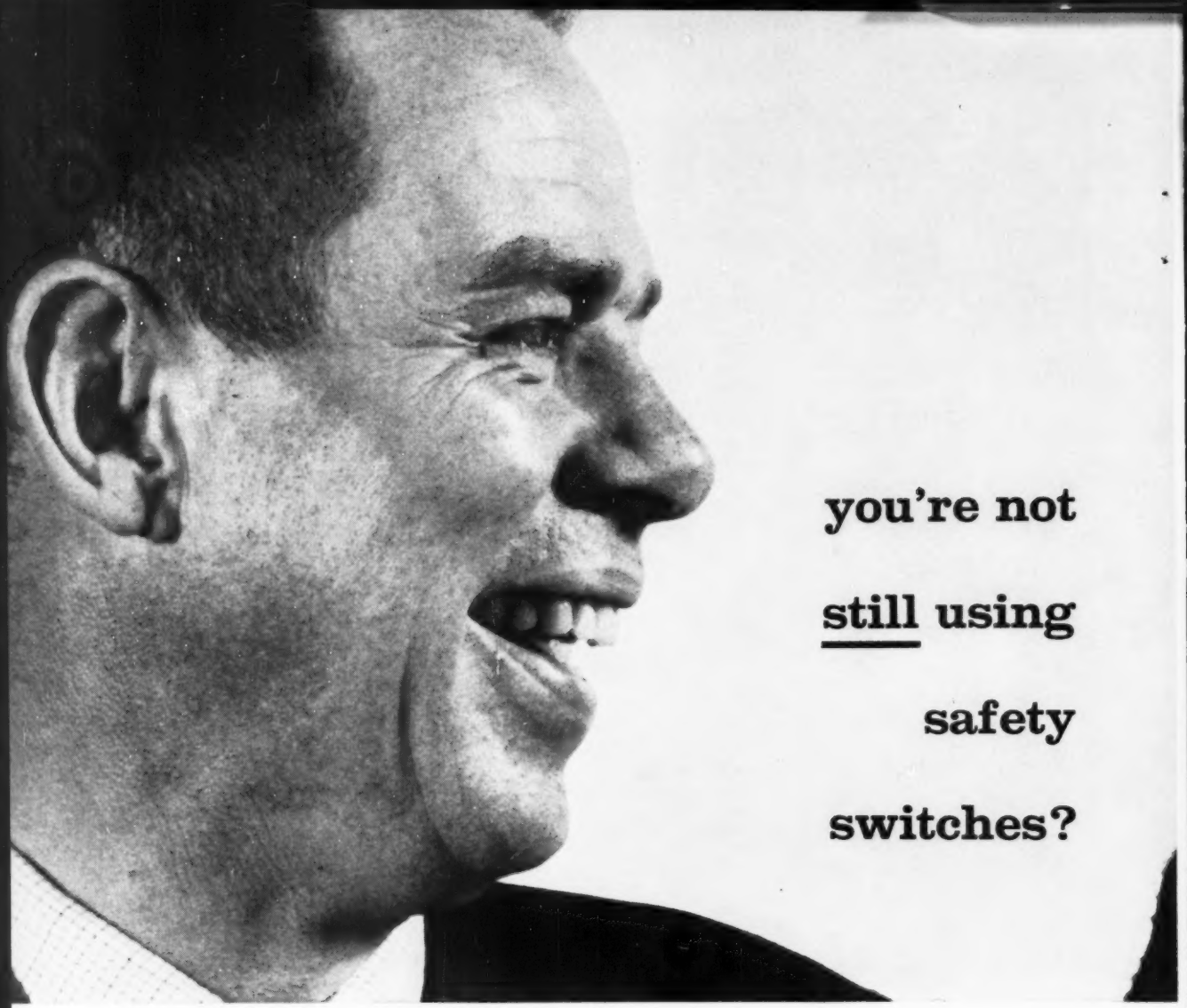

but if you are,

be sure to read these

facts from

Westinghouse . . .

Safety switches versus AB-I breakers is an old, old controversy. Westinghouse manufactures both at their Beaver, Pennsylvania plant.

Here's their authoritative, unbiased report in the interest of better circuit protection:

Fact: AB-I's cost less. In most all motor applications, AB-I's are lower priced than an equivalent safety switch equipped with fuse. (For a rating-by-rating cost comparison, write to the Westinghouse address shown below.)

Fact: AB-I's require less mounting space. To protect a given motor size, the AB-I breaker will nearly always be smaller (up to 40% smaller, never larger) than an equivalent safety switch.

Fact: AB-I's require no maintenance. No costly fuses to replace; no production time-loss due to fuse replacements; no maintenance of any kind!

Fact: AB-I's are safer. With breaker protection, motors can't single-phase. There are no exposed live parts on an AB-I breaker to endanger workmen; no need to open the cover to reset the handle; no dangerous fuse replacements.

Fact: AB-I's are more versatile. Only with AB-I breakers can you use convenient, time- and money-saving accessories such as bell alarms, shunt-trips, auxiliary interlocks, etc.

It's a fact. AB-I breakers are the safest, surest, least costly means of circuit protection. On your next order, order the best in AB-I breakers—by Westinghouse.

J-30292

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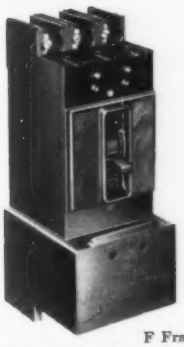
Westinghouse Electric Corporation
STANDARD CONTROL DIVISION
Beaver, Pennsylvania

TRI-PAC

Westinghouse Tri-Pac Breakers
New Boss of 100,000 Amps

K Frame

KL Frame



F Frame

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AVAILABLE NOW–
15 TO 600 AMPS

TRI-PAC— is the new kind of Westinghouse circuit breaker that handles 100,000-amp fault currents with ease.

TRI-PAC— is a triple-package of circuit protection—it combines the advantages of thermal and magnetic trips (for overloads and moderate faults) with current limiters to handle high-value short circuits.

TRI-PAC— is the smallest protective device you can apply where 100,000 amps can be poured into faults—for example, in network systems and those fed by large transformers.

TRI-PAC— is far less expensive than equivalent air circuit breakers—far safer and more convenient than switches combined with fusible elements.

TRI-PAC— is available now, in 100-, 225-, 400- and 600-amp frame sizes—all with 100,000-amp interrupting ratings.

For details on the easy application and low cost of TRI-PAC*, please contact your nearby Westinghouse sales office, or write to the Westinghouse address shown below for copies of Application Data Bulletin 29-161 and Descriptive Bulletin 29-151. J-30294

*Trade-Mark

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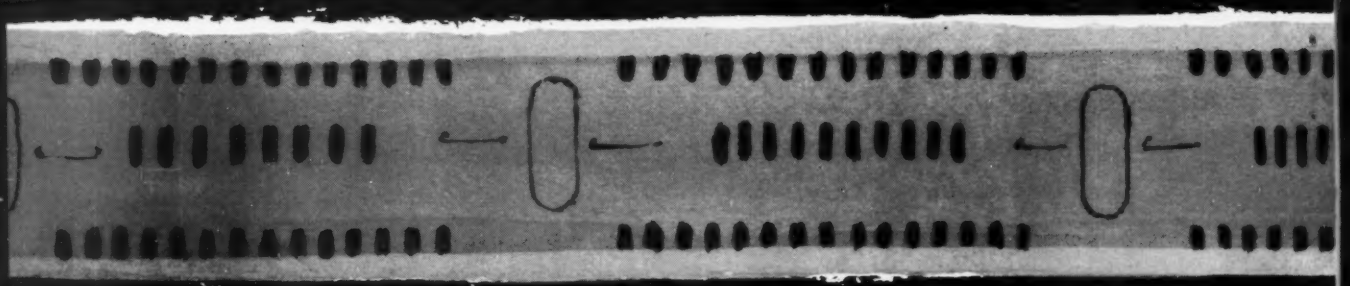
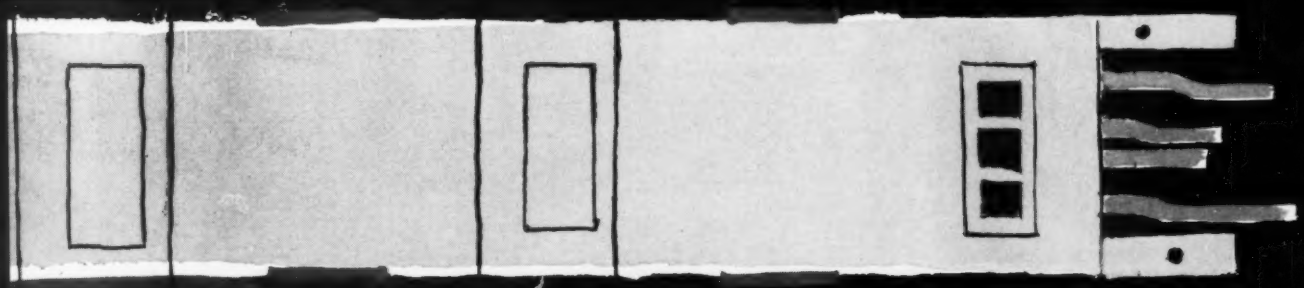
STANDARD CONTROL DIVISION
Beaver, Pennsylvania

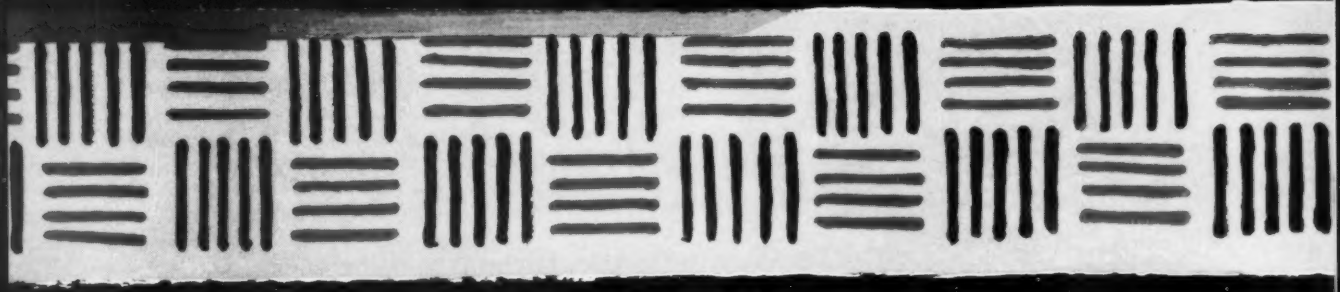


LIFE-LINE BUSWAY

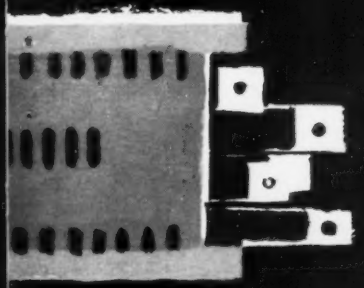


PLUG-IN

CONVENTIONAL WEATHERPROOF



LOW-IMPEDANCE



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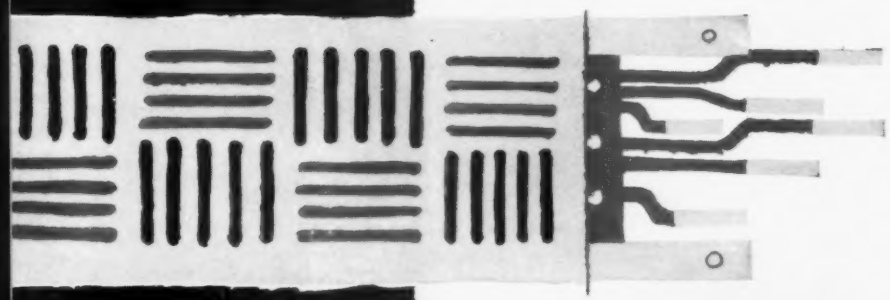
The Right Type of Bus Duct for Every Bus Duct Job

Because of the unmatched variety of bus duct he can offer, only your Westinghouse application engineer can give you unbiased assistance on the bus duct installation you're planning. He'll show you how Westinghouse can tailor-make the right system for your application—and at a minimum cost.

Westinghouse (*only* Westinghouse) offers you all this bus duct—tailor-made for every secondary power distribution job. There's Plug-In Duct; Low-Impedance; Life-Line® Busway; and Conventional Weatherproof. There's a type for long runs or short runs; with or without plug-in openings; totally enclosed or ventilated; indoor or outdoor.

Besides, with Westinghouse bus duct you get *all* of the advantages of bus duct over cable and conduit. It costs less to install, less to maintain, less to rearrange; it's safer for workmen, easier to stock and handle, and every foot is reusable.

Your local Westinghouse application engineer or distributor is the man to talk to. Phone him today! Or write: Westinghouse Electric Corporation, Standard Control Division, Beaver, Pennsylvania. J-30297



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Beaver, Pennsylvania

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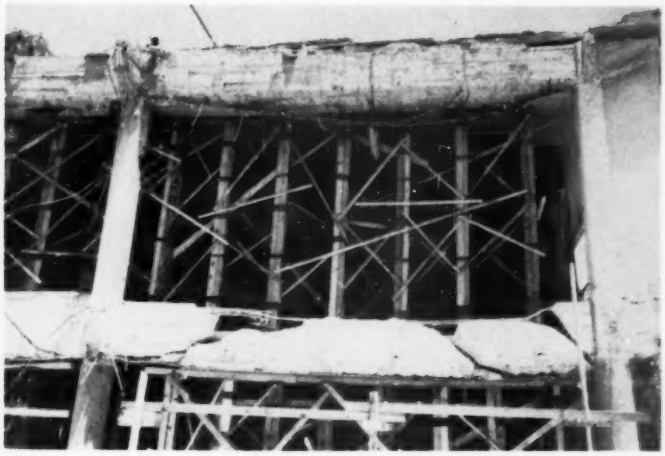
Close-up, below, shows damage to exterior of low building visible just to right of tall curved-front building in photo at left.

Report From Mexico

MARY SAINT ALBANS
Consulting Engineer Correspondent

Building damage was of several types. Here columns, girders, and slabs failed in tension.



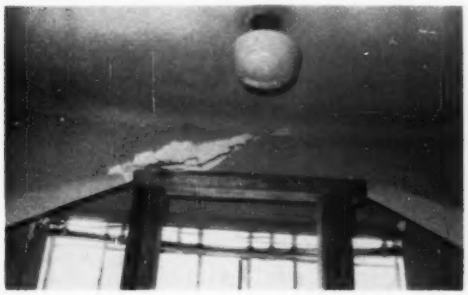
Failure of girder resulted from poor design. Note change in reinforcing steel and insufficient stirrups.

Compression failure of this girder resulted from hard hammering by an adjacent building.

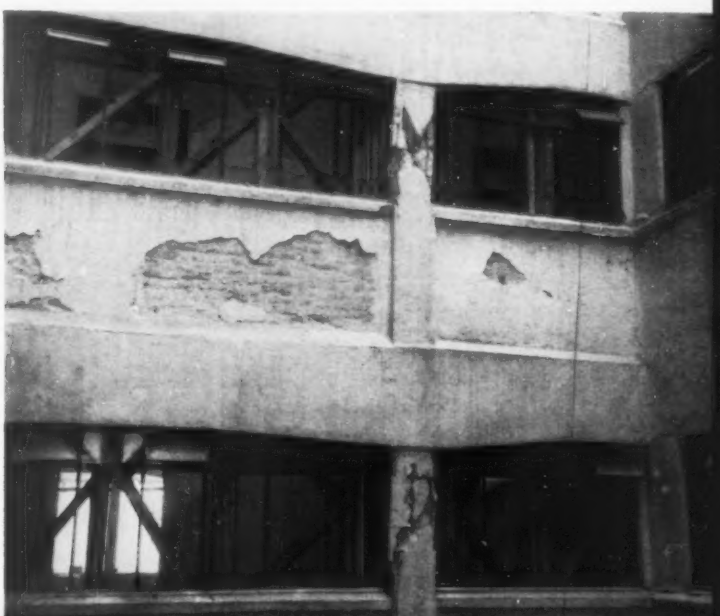
LAST JULY AN EARTHQUAKE shook Mexico City. There are no records of its intensity, but undoubtedly it was the most disastrous – both in lives lost and property damaged – in the nation's history. Sixty-eight people were killed, six buildings were shaken to the ground, and 975 more buildings were damaged. The death rate was relatively low because the quake came at 2:40 in the morning. Damages, however, ran over $25 million. So after the dust had settled, local engineers began to ask why one building stood while its neighbor collapsed?

There have been many opinions. Mr. J. H. Thornley, president of the Eastern Foundation Corporation, spent a month in Mexico studying 47 buildings and came up with the conclusion that long concrete piles supporting concrete rafts are the answer to earthquakes. He cited six pile foundation buildings that remained standing.

Thornley found "surprisingly little damage that could be blamed on poor quality of concrete in the main structural members" and "no indication of failure in the structural steel or reinforcing bars as such." So Thornley believes the most important



The ceiling crack resulted from diagonal tension in the reinforced concrete walls.



These columns failed from torsional stress. The whole building is going to be torn down.

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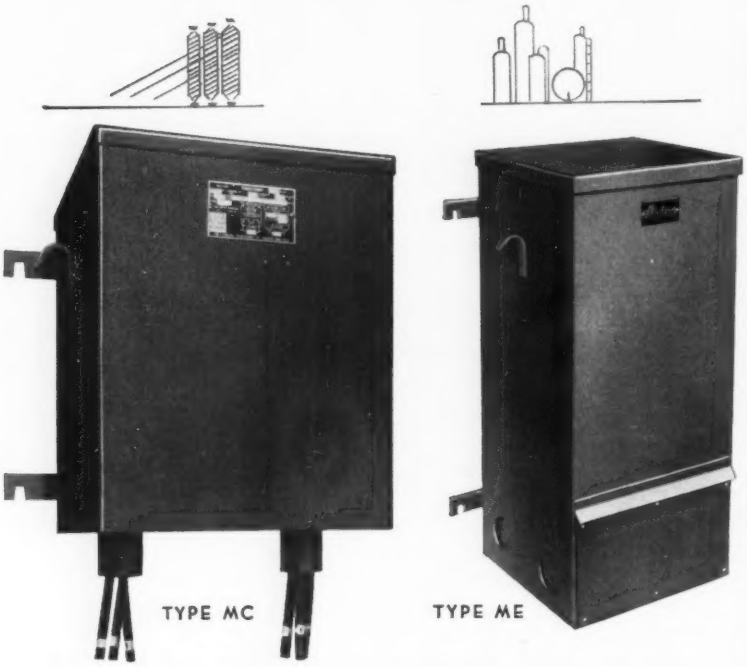

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single factor in earthquake-resistance is the foundation.

A number of Mexican engineers, who have spent a lifetime in Mexico, do not agree. Ing. Fernando Hiriart, head of the University of Mexico Institute of Engineering and member of a government investigating committee checking quake damage, said the trouble was caused by "improper design, bad construction, cheap materials, and a big quake."

Mexico's leading consulting engineer, George D. Camp – for 30 years recognized in North America as an authority on foundations and earthquakes – also pooh-poohs the theory that foundation design alone determines whether a building stands or falls. "Study the list of buildings damaged and you will see that the quake affected buildings regardless of the type of foundation. The essential features of the buildings left standing were good engineering and careful supervision. Only these can produce a building strong enough to emerge intact from such quakes."

Camp never uses pile foundations in Mexico City. He believes they affect adversely the elastic subsoil and cause trouble rather than avoid it.

Sr. Ing. Jose Guevas, consulting engineer who designed the floating foundations of the Lottery building (which came through the quake unscathed), concurs with Camp.

Ing. Wolfgang Streu, of Cimentaciones Franki, S. A., agrees that honest engineering and workmanship are the deciding factors. His company has constructed 133 foundations in Mexico, and not one building with a Franki foundation was seriously affected in the quake. Reason, according to Streu: "They were strong and well built. If an engineer starts with a good foundation such as we construct, he is not going to throw it away by using second-class engineering or material for the building itself."

Unfortunately, all structural engineering in Mexico City was not

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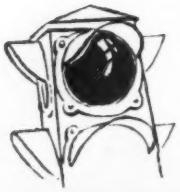

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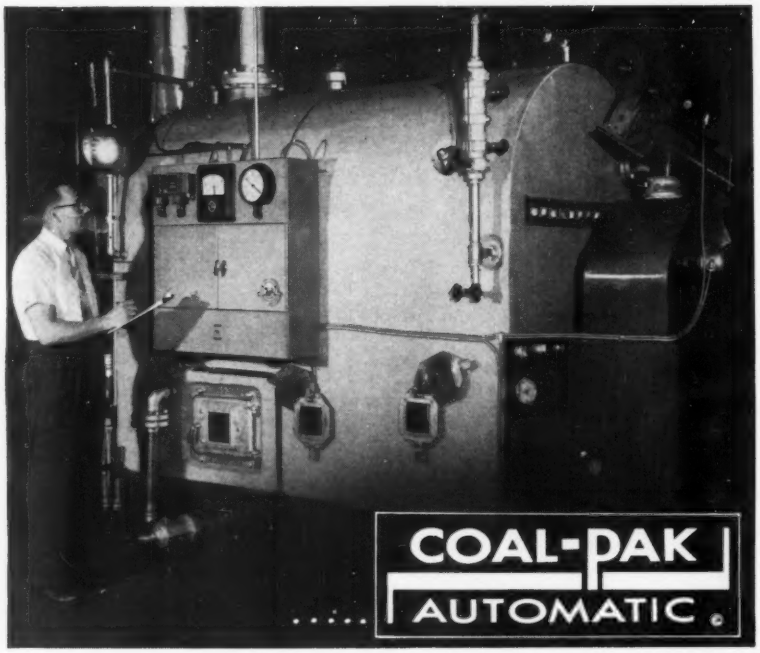

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of the best. There were hundreds of tall shaft-like structures, badly engineered and badly built. Only a few senior engineers had been giving much consideration to lateral stresses. Most of Mexico's younger engineers were in college during the '42 quake, but that quake should have taught them a lesson. At that time Mexico's only skyscraper — 15 stories high — took a bad beating and required long expensive repairs. And while Mexico's 1940 building code spelled out requirements to limit earthquake damage, many engineers and owners ignored them.

Fast, Cheap Construction

The building boom that started in the mid-'40s put the emphasis on fast cheap construction. Because office space and apartments were at a premium, buildings were high and relatively narrow to give more space for less money and less land. Many incompetent engineers and contractors began throwing tall buildings together. Few had any experience in skyscraper construction, so even some of the careful and conscientious engineers made mistakes. Code restrictions were easy to evade.

Owners harassed their engineers, demanding the buildings be completed rapidly so the mortgage could be paid off sooner. Now many of these owners face extensive and expensive repairs.

To inspect the buildings damaged in the quake, approve needed repairs, and revise the building requirements in regard to earthquakes, Mexico City government has appointed a three-man investigating commission. Members are Ing. Hiriart, Ing. Raul Marsal, and Dr. Emilio Rosenblueth, research professor at the Institute of Geophysics and Engineering, University of Mexico. These three are helped by a corps of carefully chosen engineers. So far the commission has checked 532 buildings, and in an interim report, published their findings. Of these buildings

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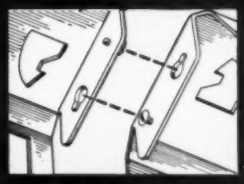

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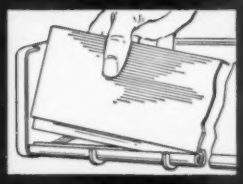

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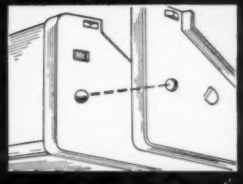

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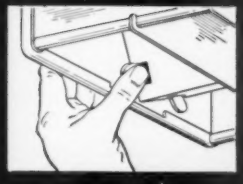

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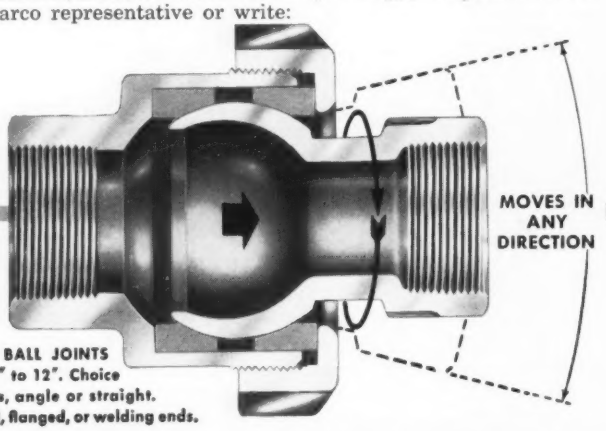

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32 are steel structures, 162 reinforced concrete, 170 brick and mortar, and the remainder old houses. By their count 108 were dangerously damaged, 180 severely affected, and the rest only slightly damaged. The six major buildings that collapsed were not included in the survey. (Of the six, five were reinforced concrete; one was steel.)

Half the 32 steel buildings checked were slightly damaged, 4 were badly damaged, and the rest need a great deal of repair. Of the 162 reinforced concrete buildings, 63 were badly damaged, 66 needed much remodeling, the rest required only slight repairs.

And of the 170 brick and mortar buildings that transferred their weight to the foundations by the walls, 102 were slightly damaged, 53 greatly damaged, and 15 need major repairs.

Most of Mexico's hundreds of thousands of pre-revolution (1912) structures remained intact. Only 136 were on the commission's list, and of them only 10 percent needed serious repair work. The rest showed moderate or slight damage. These old buildings were built in the style of centuries past: low and strongly built, with walls up to a yard thick.

Causes of Damage

The commission believes that most damage was due to three causes:

¶ Distribution loads were not considered when the building was designed. Columns and beams failed under torsional twisting.

¶ Construction defects – poor-quality material, incorrect execution of the design, incompetent direction, inexpert work, lack of control in mixing mortar and cement, and incorrect vibration analysis. Excessive flexibility caused giant wall cracks, broken windows, and steel framework deformation.

¶ Ing. Marsal also includes poor maintenance. Buildings with serious defects – strategic cracks caused by settling of the 1942 earthquake – had not been re-

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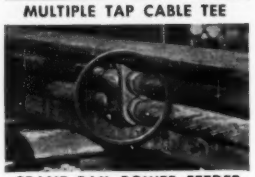
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paired, and this quake brought more serious damage.

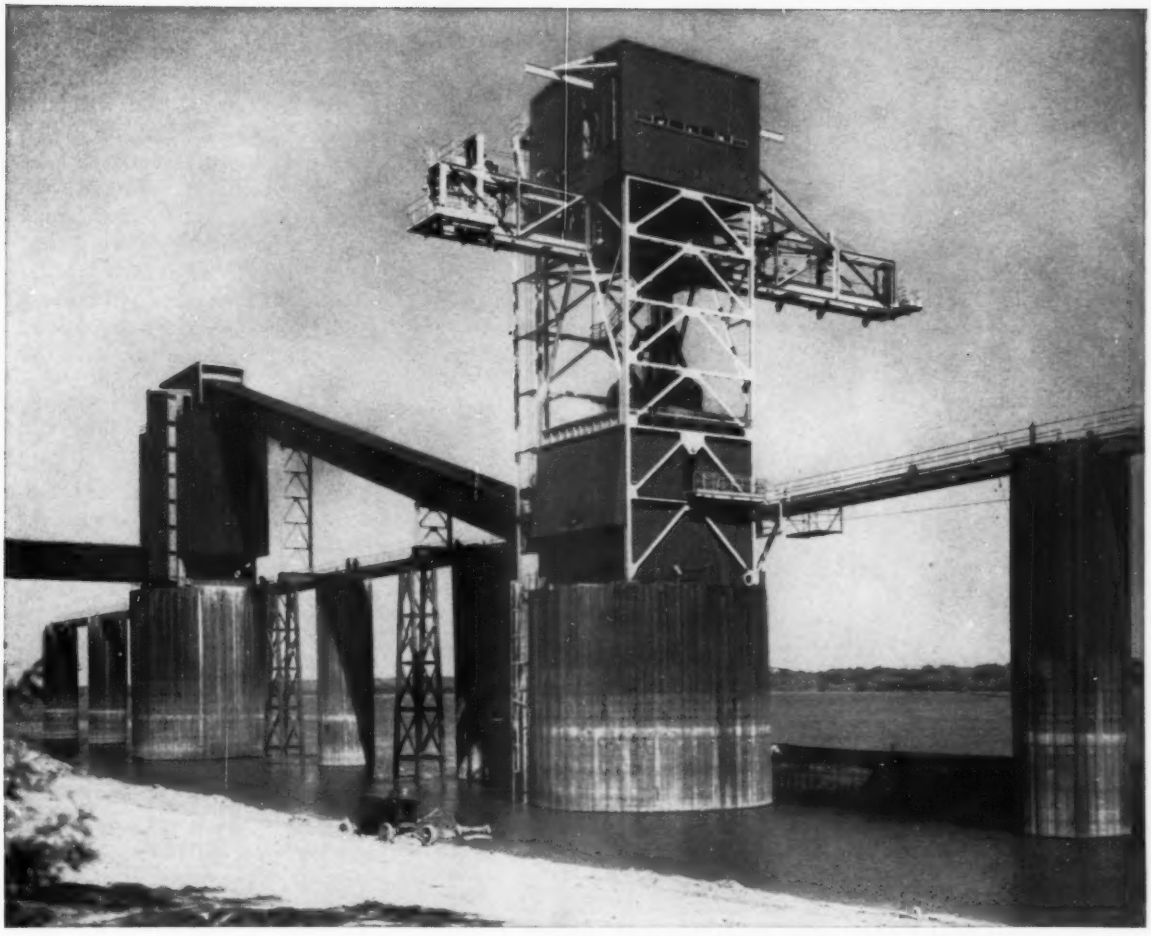
Hiriart stressed the need for reducing any possibility of hammering between adjacent buildings, a cause of severe damage in the quake. One solution is to specify that buildings must be farther apart, a common code requirement in other earthquake areas.

Rosenblueth pointed out that the soft ground under Mexico City prolonged the strong vibrations, causing additional damage. These long vibrations frightened many residents. Panic — whether from quake vibration or the more volatile Latin temperament — is a prime hazard of Mexican earthquakes.

Rosenblueth also scored the traditional method of aseismic design — designing for a given maximum intensity under the assumption no damage will occur if this theoretical maximum is not exceeded. If the maximum is exceeded, however, the building is severely damaged. He feels a more sensible approach is to design for negligible damage under a given maximum. If the earthquake is of greater intensity, chances of local damage are accepted, but the designer tries to hold to a minimum the damage from stresses that exceed his design maximum.

In reviewing design considerations for the 43-story Latino-Americano office building (which survived the quake with no structural damage), civil engineer Adolfo Zeevaert pointed out the building rests on a floating foundation. Wherever possible, nonstructural elements were kept free of structural members. Windows were pivoted vertically. Plaster fireproofing and partitions were isolated from structural members. Result: not a pane of glass broke, nor a bit of plaster cracked during the quake.

Consulting Engineer Camp commented on other major earthquakes of this half-century. As in Mexico, he found the strong buildings stood, the badly built ones failed. In the July 1930 earthquake in Italy,



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loosely jointed heavy framework bound improperly in weak mortar fell. Well-designed and well-built structures were unaffected.

In the Venezuela quake of 1928, Camp pointed out, steel and well-built concrete structures were not damaged. Frame houses that were diagonally braced also remained standing. But weak structures, where steel was used with poor concrete or where excessive weight was put on inadequate supports, failed.

Again, in the 1906 San Francisco earthquake, poorly constructed units fell, diagonally braced concrete structures went untouched.

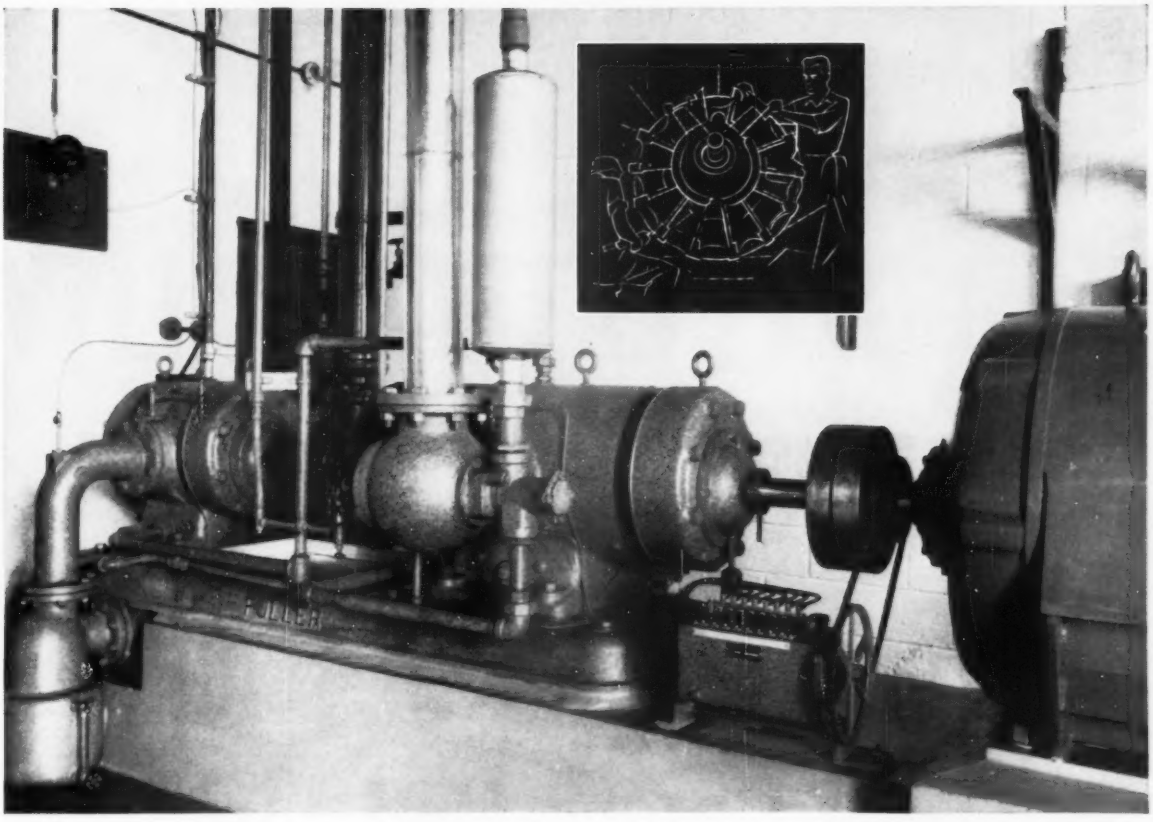
And in surprising contrast to the extensive damage in the recent Mexico City earthquake, Camp referred to the earthquake of 1912, when streets buckled in a series of waves 5-ft high. Many people were killed by panic, yet only one major building collapsed.

Unit Vibration

Camp considered the two principal types of structures: the wall-bearing type where the load is transferred directly to the foundation by the walls; and the frame structure where the load is transferred to columns and thence to the foundation. In either type Camp believes it essential that the whole structure vibrate as a unit, otherwise excessive lateral stresses are induced and it will fall. Says Camp, "The principal trouble with most wall-bearing structures is that little or no provision is made to bind the various parts together.

"If the building's free period of vibration coincides exactly with the earthquake, then the structure will vibrate in resonance with the earth's movement. This creates an increase of motion in the upper part which would mean certain disaster, even from an earthquake of moderate force."

According to the commission report, this happened in several instances in the recent quake, causing critical damage. ▲▲



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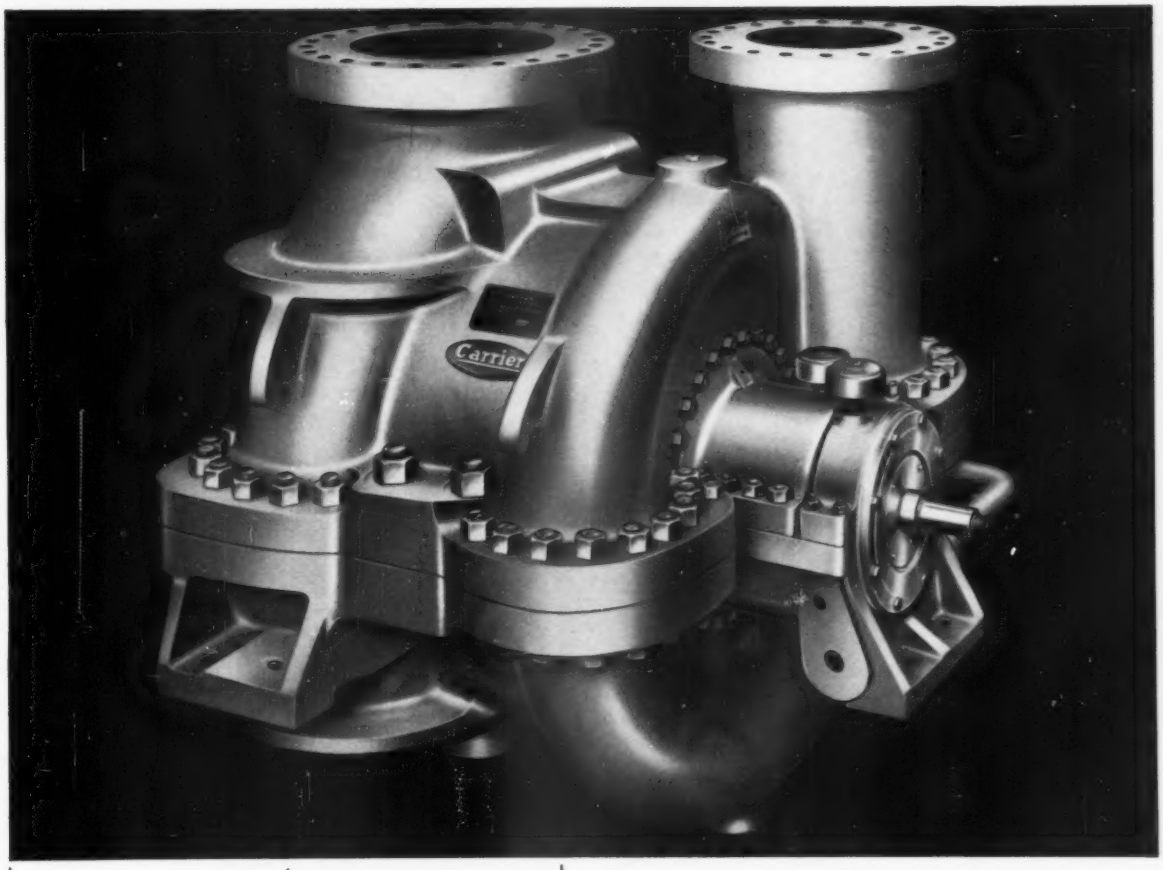
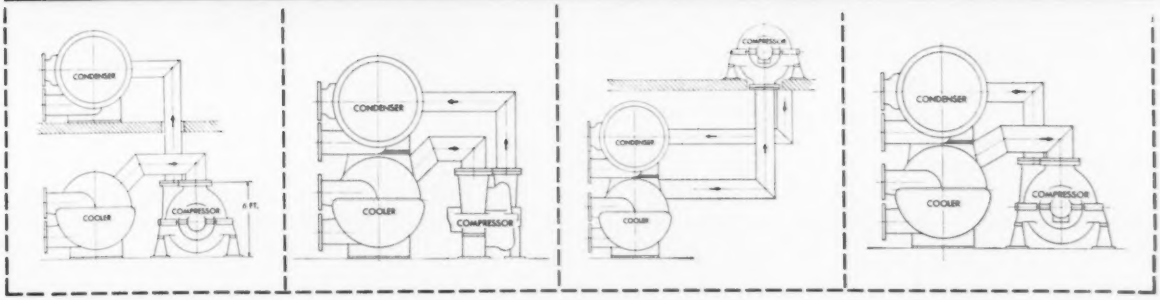




Atoms in Action

JOHN F. LEE
Distinguished Professor and Graduate Administrator
North Carolina State College

Power Cost Estimates

THE PREPARATION and evaluation of nuclear power costs can be a very baffling and frustrating experience as any consulting engineer knows. Many of the guide posts followed in the preparation of cost estimates for conventional power production are either uncertain or inapplicable when nuclear power comes into the picture. The problem is complicated further by the fact that many power engineers are not actually familiar with all the intricacies of nuclear power production.

On the other hand, physicists – who are familiar with reactor technology, relatively ignorant of the intricacies of power production, and apparently totally ignorant of economic procedures—have come up with some extremely fanciful figures for nuclear power costs. Yet neither the engineer nor the physicist is completely to blame for this state of affairs. There is an important element of hazard in estimating the cost of production from a plant in which many of the capital and operating costs cannot be supported by a background of experience.

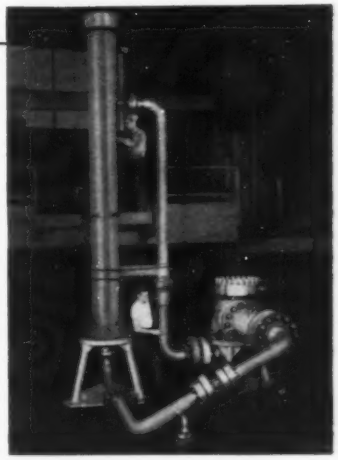
Much has been said about the favorable nuclear power costs obtained in Europe compared to apparently high domestic costs for producing nuclear power. To draw these absolute comparisons is to betray an ignorance of the basic concepts of the economic analysis involved. It is a cardinal rule in power economics that a cost estimate has meaning only for the location for which it was prepared. Such obvious factors as cost of labor, raw materials, public regulation, fictitious foreign exchange rates, and tax structure can make the cost of nuclear power production in England, for example, completely meaningless in the United States.

Another difficulty in evaluating estimates of power costs is the lack of uniformity in the preparation of the estimates. If all the cost figures used in preparing the estimate are available, there is no particular difficulty since it is possible to modify the scheme for a proper comparison with other estimates prepared in a different manner. Unfortunately, the detailed analysis is not often given. Usually only the results or a skeleton outline are made available. Therefore, questions as to whether or not such items as the building, research and development charges, transmission systems, and even fuel processing or waste disposal are included in the total cost figure cannot be answered. Most of all, the pessimism or optimism of the estimator often can be masked. This last factor almost insures that different people preparing estimates of power costs for a particular kind of plant in a particular location and following a particular scheme of analysis almost certainly will come up with different cost figures.

One of the basic problems in making estimates of the capital costs of nuclear power plants is the tendency to extrapolate from experience with conventional power plants. Some of this extrapolation is quite valid, but often it is carried to extremes. One extreme is the assumption that the basic difference between a nuclear steam power plant and a conventional steam power plant lies in the use of a nuclear reactor instead of the conventional steam generator. Except for this difference the capital costs for the two plants are taken to be identical. This type of thinking frequently is employed for what are called "rough" estimates, but such estimates are more than rough. They are, in fact, meaningless.

It is certainly clear to those charged with the responsibility of making capital cost estimates that

ALL IN A DAY'S WORK at *Pittsburgh Piping*



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This bulletin reports an intensive investigation into the problem of main steam piping materials and gives data on the stress rupture characteristics of Types 316 and 347 stainless steel piping adjacent to welded joints.

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a completely fresh outlook is needed. One needs to ask if the extensive feedwater heating schemes employed in conventional steam power plants are entirely justifiable in nuclear power plants. Are the standard AIEE-ASME turbine conditions realistic for nuclear power plants? Are the refinements in turbine and condenser design and manufacture justified in the present nuclear power plants? What about instrumentation and controls?

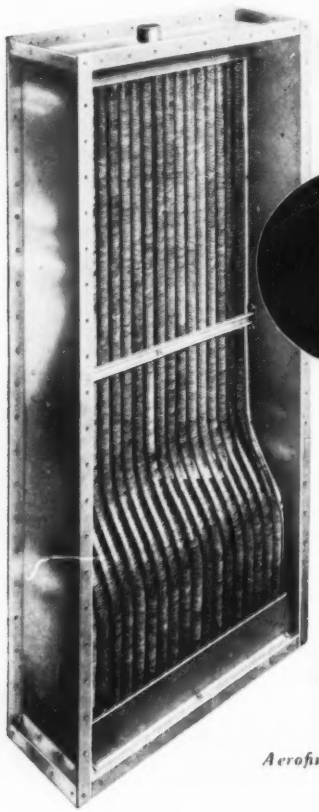
Perhaps the nuclear power plant can be justifiably built for a shorter life than its conventional counterpart with favorable economic results. The tax picture naturally enters into this factor. It is possible also that we are exaggerating the safety features being built into our nuclear power plant designs. A study of some European and Russian nuclear power plants from the standpoint of safety features would reveal how far overboard we have gone in this direction.

Nearly all are agreed that today nuclear power is not economically competitive with conventional power in all parts of the U. S. Undoubtedly some of the factors mentioned have something to do with this state of affairs. Yet when the actual cost of building a nuclear power plant exceeds the estimates by a wide margin, we must look for other factors. One can almost certainly say that two additional factors are present. One is the crash program approach in an area where cost is an important consideration. The second is a result of the first in that cost estimates must be based on unknowns and hence are really only guesses.

It may be technically expedient at this stage of development to build a pressurized-water nuclear power plant for a submarine or a public utility. But this is technical expediency and not economic expediency. One need not question the technical expediency, but there can be no justification in fact for the economics of the application. It is entirely possible that the pressurized-water reactor is the wrong type for a public utility power plant and may never be economical under any circumstances. Some other kind of reactor, such as the boiling water reactor, may prove to be the solution to the economics of nuclear power.

As a result of all these considerations, we find ourselves in the anomalous position of justifying something on an economic basis when the historical development work has not been done and the motivation is other than economic.

A fine example of the type of development work that must be done before any economic basis for nuclear power estimates can be achieved is found in the example of the experimental boiling water reactor (EBWR) at Argonne National Laboratory. Design information indicated this reactor would



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produce 20,000 kilowatts of heat and 5000 kilowatts of electricity with natural circulation of the core coolant. These conditions were met last December shortly after the plant went into operation. Towards the end of December this reactor operated experimentally at 50,000 kilowatts of heat. Last month the reactor operated continuously at 62,000 kilowatts of heat which corresponds to 15,000 kilowatts of power. These increases in the operating levels were achieved through proper developmental work without any change in the number of fuel elements in the reactor core.

One of the greatest uncertainties in preparing cost estimates lies in the fuel cycle. The cost of producing nuclear fuels and the cost of fabrication of the fuel elements are subject to the most diverse variations. Furthermore, there is practically no agreement as to how long a fuel element will last in a reactor. Experience with the fuel elements in the U.S.S. Seawolf showed that generally we are a little pessimistic about the life of fuel elements.

To illustrate the wide differences in cost estimates of power produced in the same plant based on different assumptions, here is an example given by Louis H. Roddis of the AEC. The nominal rating of the hypothetical plant is 100,000 kilowatts of power, and it sold at a fixed cost of $30 million. The first full loading has a guaranteed life of 3000 megawatt-days per ton and will cost $5 million. The second fuel loading has an estimated life of 15,000 megawatt-days per ton and is estimated to cost $2 million. The reactor is a closed-cycle boiling water reactor. Steam conditions are 600 psi at 486 F. The plant is expected to be in operation by 1962.

The table shows two estimates of the power costs for this plant. One estimate was made by an optimist in one country. The other estimate was made by a pessimist in another country.

"GUESSTIMATED" ELECTRIC GENERATING COSTS
Mills per kwh (for the same plant)

	Optimist	*Pessimist*
Fuel Costs		
Uranium costs net	1.6	2.4
Fuel fabrication	.6	9.2
Chemical reprocessing	0.1	1.2
Plutonium credit	(−2.0)	(−1.4)
Net fuel cost	0.3	11.4
Other Operating Costs	0.5	1.8
Fuel Inv. Charges	0.0	0.6
Fixed Charges	1.2	17.8
Net Cost	2.0	31.6

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Why a Steam Trap Has to Handle "Air"

Low temperatures and corrosion of equipment are often evidence of inadequate trap air venting capacity

Air, with its load of oxygen and carbon dioxide, has an unwholesome habit of interfering with the efficiency of steam heated units. If steam were always free of these undesirable companions, things would be a lot simpler for men-who-operate-plants. Because it isn't, three unhappy situations frequently occur:

1. ***Operating temperatures are subnormal.*** This is a two-part problem. First, an air-steam mixture has a lower temperature than pure steam at the same pressure—see Table A. Secondly, air can "plate out" on heat transfer surfaces as shown in Figure 1. Under some conditions, such an air film will knock down heat transfer efficiency by as much as 50%.

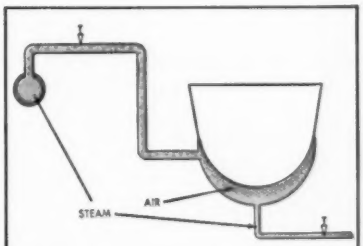


Fig. 1. *How air can "plate out" on heat transfer surfaces. This "insulation" drastically reduces heat transfer efficiency. Armstrong trap operation creates turbulence in the equipment that prevents this.*

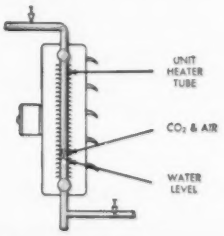


Fig. 2. *Corrosion occurs when units are not kept continuously free of both condensate and air. Armstrong traps discharge both,* at steam temperature, *as fast as they accumulate.*

2. ***Corrosion rears its ugly head.*** Oxygen and carbon dioxide are real trouble-makers. CO_2 gas goes into solution in condensate, forms carbonic acid and chews away at vulnerable metal sections. O_2 aggravates the situation. See Figure 2.

TABLE A—How air reduces steam temperature.

Gauge Pressure	Temp. of Steam with No Air Present	Temp. of Steam Mixed With Various Amounts of Air (% Air by Volume)	
		10%	30%
10.3	240.1	234.3	220.9
25.3	267.3	261.0	246.4
50.3	298.0	291.0	275.1
75.3	320.3	312.9	295.9
100.3	338.1	330.3	312.4

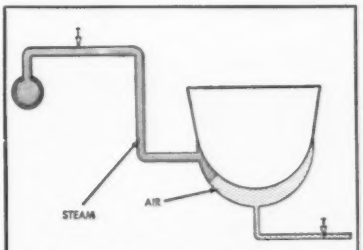


Fig. 3. *When steam is turned on, it takes a trap with extra air venting capacity to provide fast heat-up.*

3. ***Heat-up is slow as a snail.*** Air has a picnic in units that are shut off periodically. Figure 3 pictures the problem. Lines and equipment literally fill up with air. When the steam is turned on it can get in only as fast as the air gets out.

Enter Steam Traps

Curing these steam system ailments involves an operation sometimes called a "trap transplant." It consists of removing traps that don't get the air out and replacing them with traps that do.

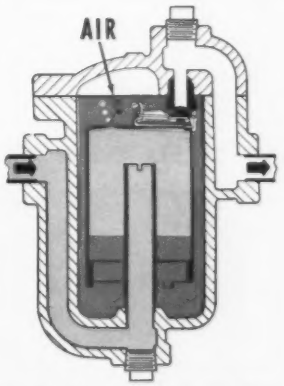
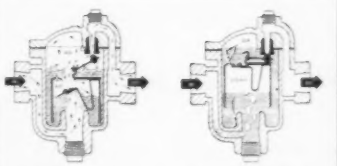


Fig. 4. *Air entering an Armstrong trap passes through the bucket vent and accumulates in the top of trap. When trap opens, air is discharged along with condensate.*

Figure 4 shows how an Armstrong inverted bucket trap continuously vents air. What the picture doesn't show is a built-in plus-value of this trap's design. An Armstrong trap opens suddenly, creating a momentary pressure drop and turbulence in the unit being drained. This breaks up air films and "pumps" air down to the trap so it can be vented.

The vents in standard Armstrong trap buckets will pass all the air normally encountered. In special cases, such as paper machine dryers, the vents are correctly sized larger at the factory to meet the requirement.



Thermostatic vent open. *Thermostatic vent closed.*

Fig. 5. *Open float with thermostatic vent for off-and-on units. When trap is cold, vent is open, permitting air to blow through when steam is turned on. When steam reaches trap, heat closes thermostatic vent. Then, regular bucket vent handles all air coming in with steam.*

Open Float with Thermostatic Vent

Super air-venting capacity is a must for fast heat-up of low pressure unit heaters, heating coils, steam headers and other units that are on-and-off. Figure 5 shows how the Armstrong open-float-with-thermostatic-vent trap takes care of this.

* * *

The 44-page Armstrong steam trap book covers other features of the Armstrong trap as well as its excellent air handling characteristics. This catalog also discusses trap selection, installation and maintenance. Your local Armstrong Representative or Distributor will be glad to give you a copy. Call him, or write Armstrong Machine Works, 9653 Maple Street, Three Rivers, Michigan.

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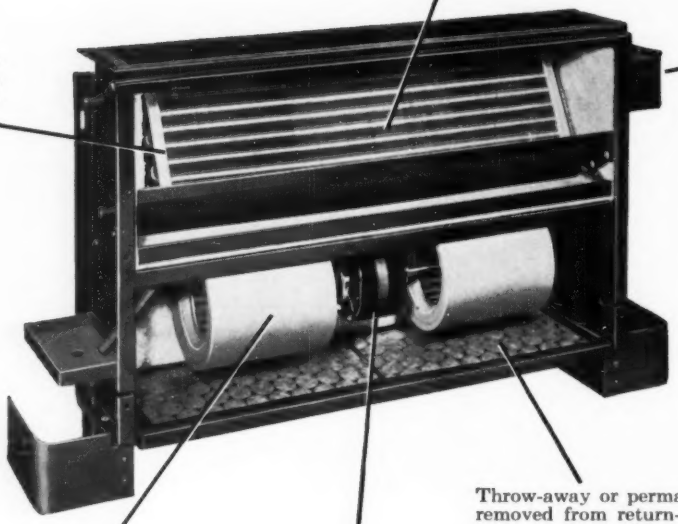

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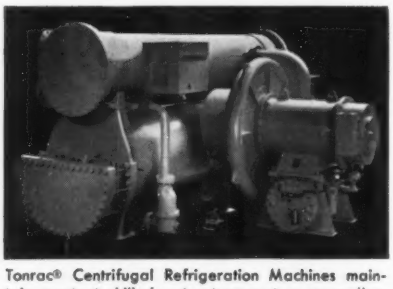

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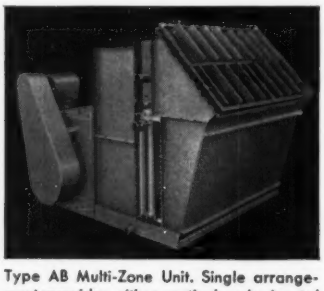

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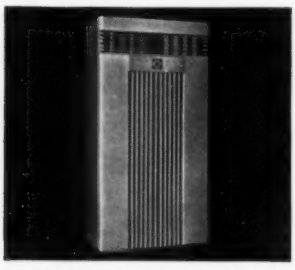

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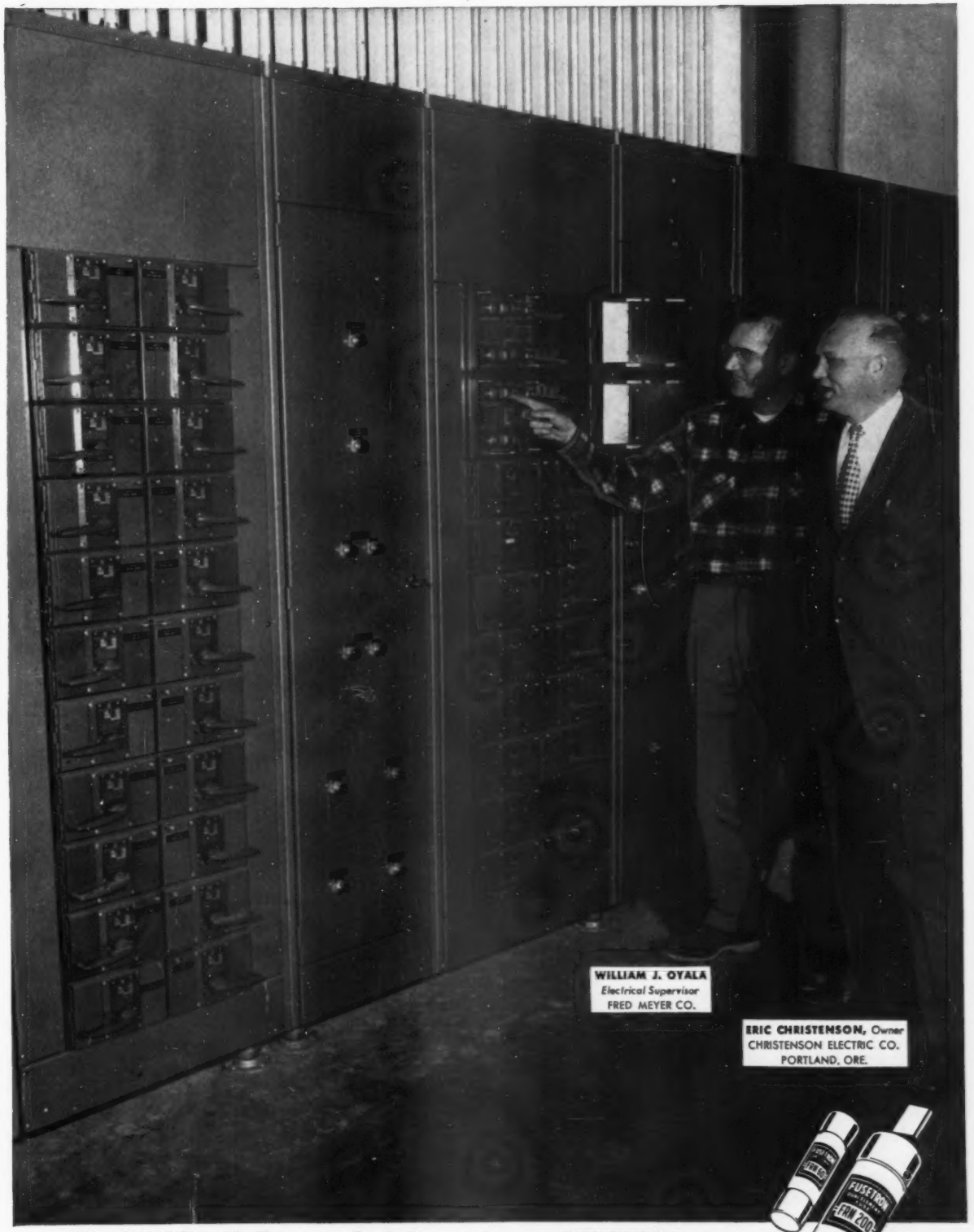

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Report From The East Coast

STAFF

THE CONSULTING ENGINEERS COUNCIL, through a series of visits to Washington, D. C., is well on its way toward several of its objectives – better fees for the consulting engineer, forming a workable relationship with government agencies, and more recognition for the profession.

Introductory meetings (see East Coast Report, January) defined the problems. Through later meetings, plus gatherings with additional agencies, the Council is beginning to make its voice heard.

Standardization of Selection Procedures

One of the primary objections, originally, to the government-consulting engineer relationship was an apparent lack of coordination among the various government agencies. The Corps of Engineers, the Bureau of Yards and Docks, the Air Force, and others who used the services of consulting engineers, all had different forms for the consultant to fill out in order to be considered for government contracts. This was one of the first problems discussed by the CEC with the various groups.

A Task Force for the Review of Government Policies and Procedures had been established some time ago to discuss such questions. However, prior to the CEC Washington visits, the Task Force had met only once.

Now active, the Task Force assigned Study Group 16 to the problem. A single experience sheet, which could be used by any government agency to gather data on consulting engineers, has been compiled. So far, the Corps of Engineers, the Bureau of Yards and Docks, and the Air Force have approved the data sheet.

"It's a step toward standardization of the government agencies in their dealings with consultants," explained John K. M. Pryke, past CEC president and member of the Washington delegation.

Per Diem Fee Discussions

Another major step forward is being taken as a result of the CEC trips to Washington. The $50 per day statutory limitation on per diem fee for consulting engineers may be raised to $75 per day – still inadequate, but a step in the right direction.

The Department of the Army, in connection with military appropriations, has taken action to "up" the $50 per diem rate. In order to do this, the Army first had to secure approval from the Bureau of the Budget, which made no move to block the measure.

The CEC has gained assistance in its battle against the $50 per diem rate from another source – the National Society of Professional Engineers. In a recent news release, NSPE announced it is requesting a maximum per diem rate of $100 for consulting engineers working for the Federal government. Pointing out that the current per diem rate (NSPE is under the impression that it already is $75 per day) is insufficient for the economically feasible performance of consulting engineering services, NSPE added that "the Federal government deserves and is entitled to the very best engineering talent obtainable."

Fee Percentages

The Armed Services, along with CEC representatives, also have agreed that the current 6 percent statutory limitation on design fees is inadequate, particularly for small projects or projects of an unusually complex nature. However, Congressional action would be needed to raise the 6 percent

7 ENGINEERING REASONS *Why*

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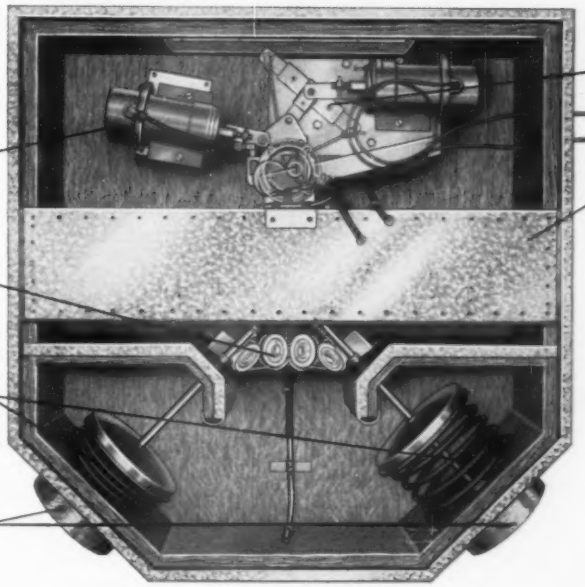
1 CONSTANT VOLUME CONTROL
2 HIGH QUALITY COMPONENTS
3 PATENTED HELICAL NEOPRENE SPRING DAMPERS
4 45° INLETS
5 UNITIZED LINKAGE MECHANISM
6 CHOICE OF SOUND BAFFLES
7 MODELS FOR EVERY REQUIREMENT

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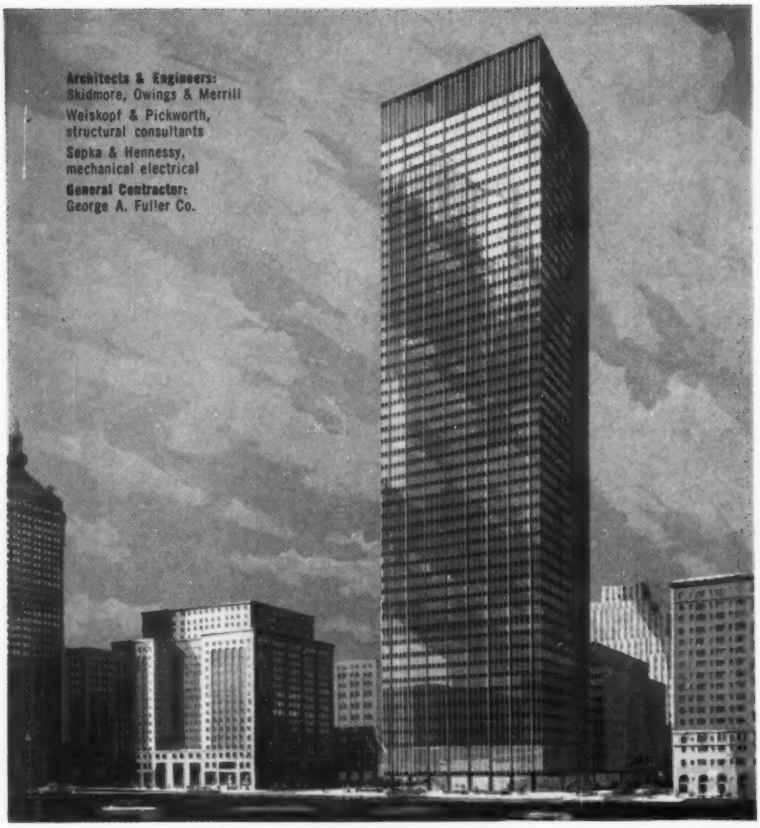

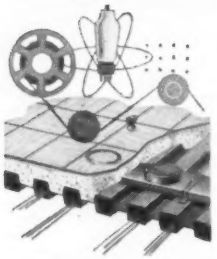

Anticipating tomorrow's electrical load in New York's newest skyscraper

52-story Union Carbide Building will STAY modern with Milcor Celluflor — 900,000 square feet of it!

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Electrical flexibility is just one advantage of Celluflor. Others include savings of steel, footings, construction time, and overhead. See Sweet's, section 2a/In — or write for catalog 270.

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figure, and it is doubtful if this could be brought about during the current sessions.

In recent meetings with the Defense Department, CEC again mentioned the low fee scales, the basis of computing fees, and the frequent variations between preliminary and final cost estimates.

Max Barth, chief of the technical division, office of the director of construction for the Assistant Secretary, Department of Defense, explained that the basis of fee determination used by the Armed Services is the estimated cost to the architect-engineer for providing services of the scope outlined.

More Information Needed

CEC said that a number of complaints have been received in regards to the 10 to 15 percent theoretical profit generally provided in negotiations with the Corps of Engineers. The committee members pointed out to Barth that most engineers compute fees on a percentage of construction cost, either actual or final estimates, and that the final estimates therefore substantially affect the fees. They added that the government's contracting officer generally has a good understanding of a project with which he is dealing, and – inadvertently – the contracting officer sometimes fails to pass along this knowledge to the consultant who is attempting to estimate his fee.

Also, the contracting officer has been allowed the time to become thoroughly familiar with the project, while the architect-engineer generally is not allowed adequate time to familiarize himself with the project before fees must be set. CEC suggested that contracting officers could furnish consulting engineers and architects more detailed information on the scope of the project before bids are required. Future discussions are to be held on this suggestion, and possible ways to remedy the situation.

CEC also discussed the possibilities of consultants and architects

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Attractively custom-designed and prefabricated Control Center enables only authorized personnel to supervise and control any heating and air conditioning plant, large or small.

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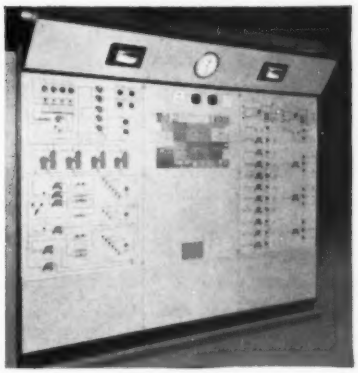
Installation may call simply for temperature indication or can show complete system schematics. Electronics do the leg work . . . at a glance the operator can visualize all of the system's functions, periodically check temperatures anywhere, and remotely readjust comfort conditions. Flexible to fit any installation.

Ultimate in control. Electronic Control Center like the Teletype Building installation, above, meets all needs of all parts of the building all the time. Forestalls discomfort by giving instant detection and correction for load and weather changes. Instantly reveals any operational failure in the comfort system.



Electronic Control Center assures automatic air conditioning control of new Teletype plant in Chicago. J. Emil Anderson, architect and industrial builder; Dell Corporation, heating and air conditioning contractors and engineers.

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"Basic Unit" LIGHTING System

simplifies lighting modernization in 1,000,000 sq. ft. 165 N. Canal St. Bldg. REMODELING PROGRAM

Mr. Carl H. Bauer, Construction and Equipment Manager of Butler Bros., and Mr. Howard W. Kennedy, Chief Engineer, of Hultgren Electric Company check over plans for remodeling 1,000,000 sq. ft. of former Butler Bros., Chicago warehouse into office building space. Both men agree, initial use of the Electro Silv-A-King "Basic Unit" System permitted modernization of the lighting with a considerable savings in cost and time.

Original "Basic Unit" Rapid Start "Skyliner" bare lamp fixtures. Installed in 1952 when conversion into office building began, this was first large Rapid Start installation in the country. Original remodeling plans called for modernization of area in 1957. The ability to convert the "Basic Unit" to a modern, shielded fixture made it the perfect choice for this area.

Electricians install "Skylouver" basket on original "Basic Unit" "Skyliner" fixture. Time required: A fraction of a minute. Electro Silv-A-King is constantly developing new basket designs for use in their "Basic Unit" System so as to permit "up-dating" of the lighting with a minimum investment in cost and labor.

Completed installation shows attractive, shielded lighting that provides greater seeing comfort and a more attractive working environment. Entire area has also been air conditioned and properly ventilated. "Basic Unit" System helped maintain time schedule and keep total cost within 4% of original 1952 estimate on job totaling over $7,000,000. Butler Bros., like many other major users, have found the "Basic Unit" system so successful that they are now using it in many of their stores.

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being used more often for supervision of construction on projects they designed. Barth pointed out that the use of consultants to supervise their own projects is not forbidden by the Defense Department's instructions to the several Armed Services. However, anyone discussing this subject in Washington usually is reminded that the government has adequate staffs of qualified and experienced personnel to perform such work. CEC pointed out to Barth that opinions vary as to the adequacy of government staffs.

Cost Complaints

Reported discrepencies between government's estimated costs of projects, and the actual costs, also was discussed recently with Fred S. Poorman, Deputy Commissioner of Public Buildings Services, General Service Administration.

Poorman emphasized that the GSA is just beginning to "get its feet on the ground" regarding the handling of its present construction program. He added that current budget costs, however, are realistic and said no complaints have been received in recent months. He believes most CEC complaints relate to older buildings or projects not related to the GSA. Poorman agreed, however, that on modernization work, budgets do differ from construction costs.

CEC representatives also told Poorman that since consulting engineers frequently work as subcontractors to architects, the architect has the opportunity of gathering competitive bids if he so desires. Since the architect gets the prime contract, he can go to a number of consulting engineers (with each consultant unaware that the project is being discussed with others) and learn what the consultants' fees would be. Then the architect can select the lowest fee.

Poorman questioned suggestions that (1) contracts be negotiated on a joint venture basis, or (2) that fees to be paid the consulting

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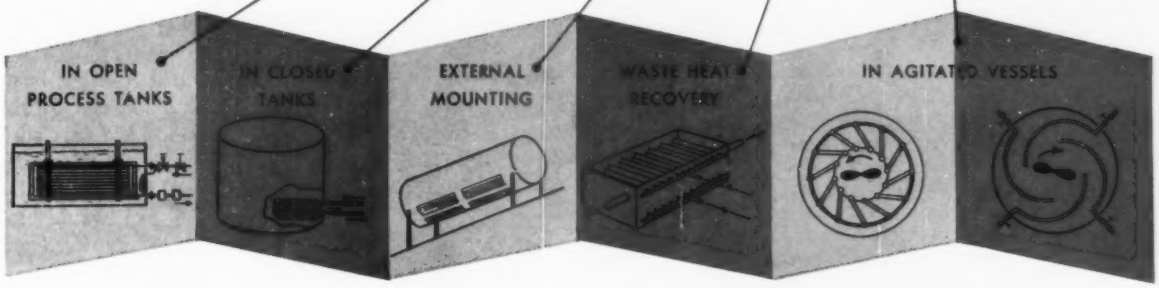
The simplicity and versatility of Tranter PLATECOIL heat transfer equipment may be just what you've needed for your special heat transfer problems.

A Tranter PLATECOIL consists of two embossed metal sheets, seam and spotwelded together to form channels for the passage of heating or cooling media. Compact, lightweight PLATECOIL units are furnished in a wide range of standard sizes and styles.



PLATECOIL requires about half the space required by pipe coils and accomplishes heat transfer fully 50% faster than pipe coils.

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In addition to the many standard styles and sizes, PLATECOIL units can be tailored to fit your exact specifications. Factory fabricated groups, units rolled to specific diameter and units flat on one side are available. PLATECOIL can be galvanized, metallized, electro-polished, polished for food service, prepared for various finishes and furnished with special connections.

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*Ductile (Nodular) Iron meets the requirements of the ASME Code for use in vessels at pressures to 1000 psi and temperatures to 650°F (80% of cast steel service).

1. Safer to use because Ductile Iron body and cover will bend or twist in case of explosion or fire whereas brittle materials might shatter or break.

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4. Connections: Traps with screwed connections regularly furnished. (Although Ductile Iron can be welded or brazed under controlled shop conditions, welding is *not* recommended for field fabrication.)

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engineer should be written into the architect's contract. However, Poorman promised to consider a suggestion that the architect be required, during contract negotiations, to name the consultant with whom he would be working. Then, if the architect showed up with a different consultant, the GSA would have good reason to ask "why."

Joint AIA-CEC Committee

Since last autumn, the CEC representatives in Washington also have been investigating the possibilities of a joint AIA-CEC committee. Recently, AIA notified Edward J. Wolff, CEC president, that AIA has eliminated joint committees with NSPE, the American Society of Heating and Air-Conditioning Engineers, and the American Society of Civil Engineers. AIA now hopes to solve all of its engineering problems with a joint committee with the Engineers Joint Council.

However, AIA invited CEC representatives to participate as observers at committee meetings and deliberations until the CEC application for membership in EJC is accepted. They said:

"As you know, the AIA has been negotiating with Federal Government for 101 years . . . We are sure that in joint efforts in this direction our societies could be mutually helpful. However, we would not wish to deter you in any way from going ahead on your own."

Wolff reminded AIA that EJC "comprises a much broader denomination, and it would certainly appear that when handling specialist problems, it would be better to use the more detailed type machinery. This, of course, is no reflection on EJC as an over-all engineering interest group."

The CEC president also supplied AIA with a list of government agencies, and the dates when CEC members would meet with them. He invited AIA to contact the Washington representatives if they have an interest in any of the meetings. ▲▲

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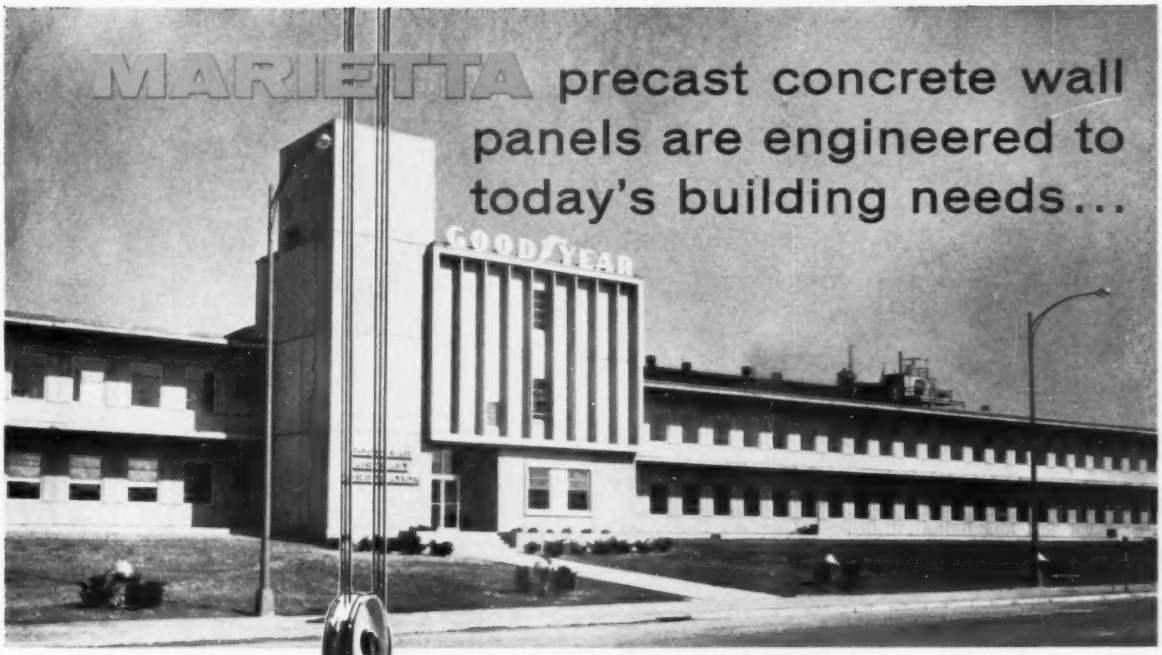

The new Goodyear Research and Development Center at Akron, Ohio, features the use of Marietta panels with lift-slab construction.

Complete design flexibility and choice of many textured finishes make Marietta concrete wall panels extremely functional for buildings of every type. When used alone or in combination with other building materials they present a clean, modern appearance.

Marietta concrete wall panels are available solid or with an insulation core making their 5" thickness superior in insulating quality to a 12" masonry wall.

Easy erection of Marietta wall panels cuts building time and labor costs. In conventional curtain wall construction cast-in clip and bolt fasteners simplify attachment of panels to building framework and in lift-slab construction similar easy attachment methods are used. Snug fitting tongue and groove joints are caulked or mechanically sealed insuring complete water tightness.

With Marietta concrete wall panels construction can be carried out, even in the coldest weather, because there's no costly, time-consuming backing up with brick or masonry. This feature means less dead-load . . . extra floor space.

A WIDE VARIETY OF TEXTURES is available in low cost Marietta precast concrete wall panels from a handsome broomed finish to colorful exposed aggregates of marble, quartz or granite surpassing the appearance of costly solid cut stone. All finishes are permanent and non-fading . . . will not become dulled by weather.

WRITE FOR COMPLETE SPECIFICATIONS. See how Marietta panels can help you add beauty, economy and speed to your next project. Complete erection service available under one cost-saving contract by our own experienced crews. Our engineering department is ready to advise and assist architects, your engineering staff, consultants or contractor in all phases of planning and construction.

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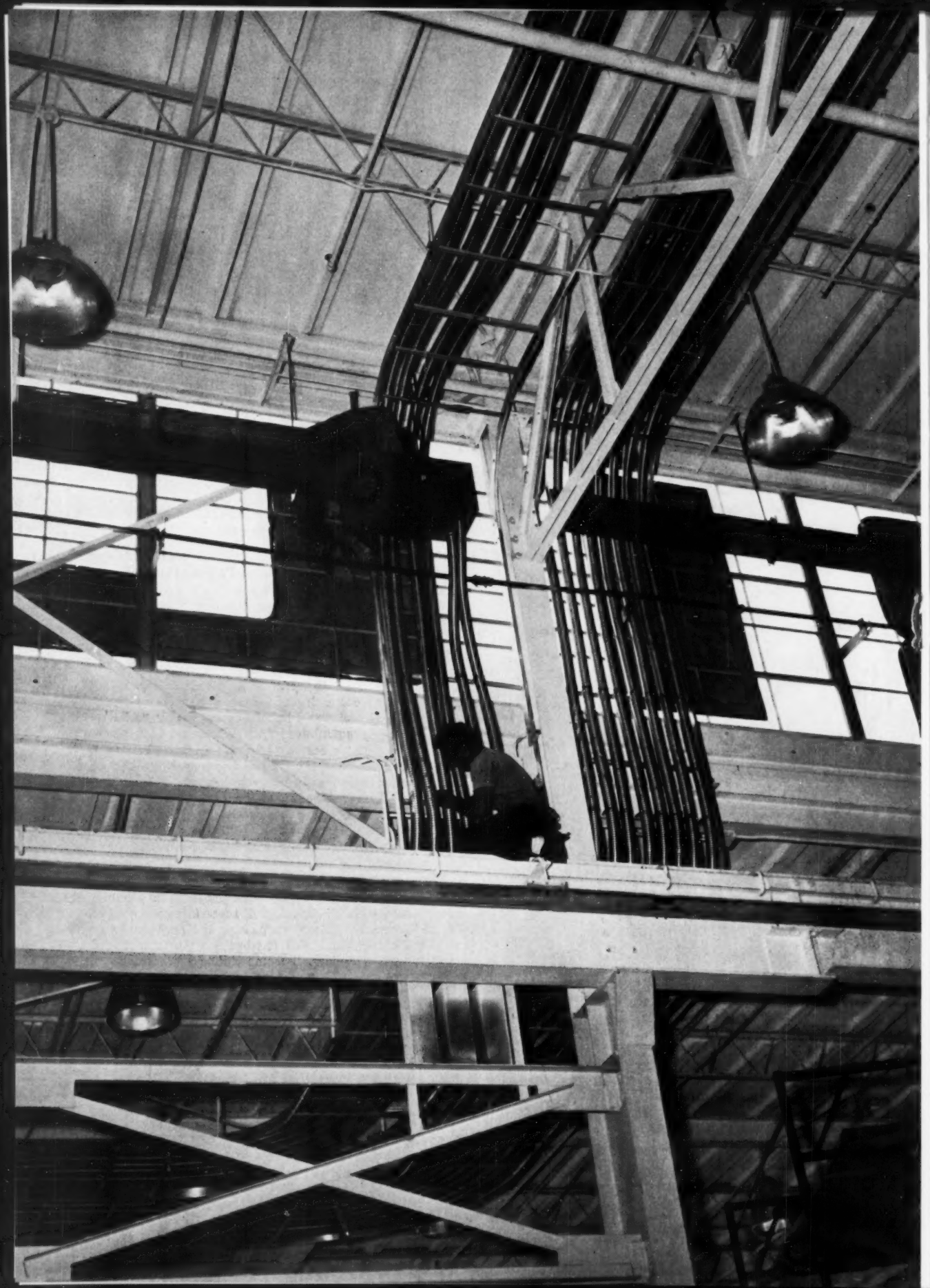

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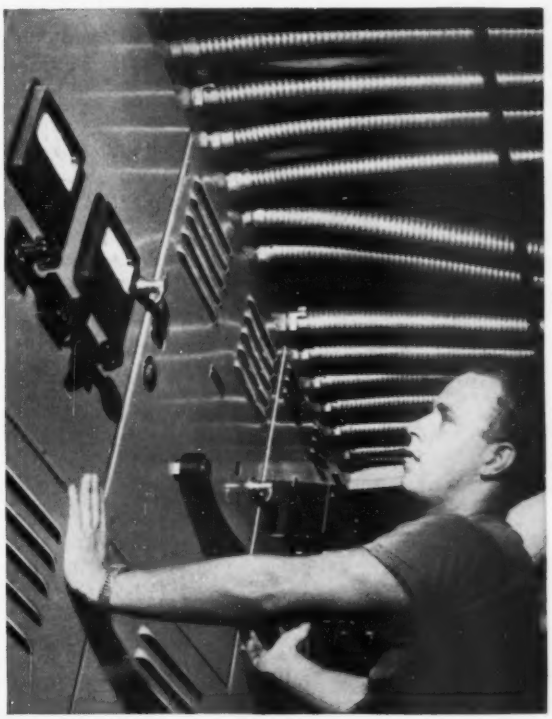

THE FLEXIBILITY of Duralox Cable enables neat, efficient installation and facilitates equipment and terminal connections.

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Beyond Our Borders

Roads Scholar

Captain C. D. Curtiss, who is touring Central and South American countries for the International Road Federation, reports:

Brazil. "There is very little possibility of opportunity here for either U. S. contractors or consulting engineers on highway work. The Federal government has a five-year program under way in which they hope to construct 12,000 miles of new roads, with 5000 miles of paving and rehabilitation of old roads."

Uruguay. "A German firm is building a hydroelectric dam and plant; a French firm is building a large bridge; an Italian firm is building a pipeline. I am told that U. S. firms were given an opportunity to bid. Another large bridge will be advertised in June or July. No need for U.S. engineers."

Argentina. "My previous reports . . . were largely negative so far as opportunites for U. S. contractors and engineers are concerned. Here I think the situation may be different . . . Of immediate importance is a highway project coming up in a few months for which more than 100 million pesos is available."

Chile. "A number of (road) projects under construction. Because of inflation, firm contracts are impossible. The Highway Department issues warrants, but cashing them is difficult. Interest rates go as high as 20 percent . . . serious financing problems because of the runaway inflation. I am of the opinion there will be no attractive opportunity here soon for U.S. consulting engineers."

The Burma Lode

The Government of Burma has asked for assistance in the proper exploitation of its mining wealth — a need it has felt since 1950 when Burma became an independent nation. A major problem has been a shortage of men skilled in mining techniques.

Burma is rich in minerals, particularly in tin and tungsten. Coal recently has been discovered 300 miles to the north of Rangoon on the fabled road to Mandalay. There is also zinc, lead, and iron ore. But until more men are trained to mine underground veins, the mineral wealth is of little value.

Since the war, Burma has depended on India to supply coal. If Burma can produce its own, it will be able to rebuild a once profitable mineral export market to pay for badly needed industrial tools.

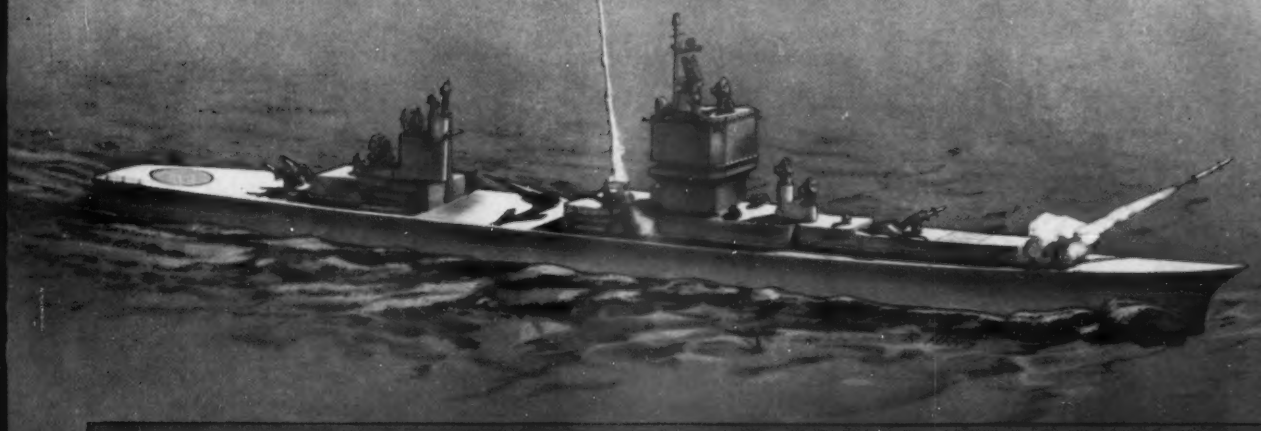
A mining school at Insein, Burma, 12 miles northwest of Rangoon, trains young Burmese men as mine surveyors, shift bosses, plant foremen, mechanical supervisors, and assistant engineers. The Technical Institute has 53 mining students. About 450 more are studying civil, electrical, and mechanical engineering.

The students come from all of Burma's five states. Each receives an allowance which pays his board and room, school supplies, and gives him some spending money. They are lodged in hostels built and operated by the Burmese Department of Education. The Technical Institute is sponsored by the Burmese government, with instructors furnished by the International Labor Organization.

India Hydroelectric Project

The $84-million Sharavati Valley hydroelectric project in Mysore State, India is expected to provide the largest single electrical system in that country. Construction work was begun in February. When completed the system will produce about 4.5-billion kwh of electrical energy annually, equivalent in energy value to approximately 5.5-million tons of lignite, mining of which is being initiated

World's First Nuclear-Powered Surface Ship will have MIDWEST Welding Elbows

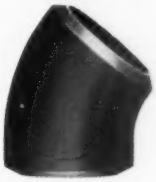


U. S. Navy's guided missile, nuclear-powered cruiser "Long Beach"

OFFICIAL U. S. NAVY PHOTOGRAPH

Special Fittings are "ROUTINE" for Midwest

Stainless Steel
S.R. 102° Elbow
with tangent on one end.



Stainless Clad
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with tangent on one end.

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S.R. 90° Elbow
with tangent on both ends.

Special Elbows (dimensions, tangents, wall thicknesses and materials) are easily provided by the exclusive and flexible Midwest method. Elbows are available in any material that can be secured as plate, which also means better delivery. Closer tolerances are inherent in the Midwest process. Quality control always exceeds Code requirements.

Shown here are three of the special stainless steel and stainless-clad elbows made by Midwest for the "U.S.S. Long Beach". All reactor coolant piping must meet extremely rigid specifications because of the difficult service. Special quality controls, such as ultrasonic testing, intergranular corrosion tests, dye checking, radiography, and ring flattening tests were used one or more times at various stages of manufacture from the raw material to the finished fittings. Special quality standards for soundness of metal, "water clear" welds, dimensional accuracy, and surface finish were satisfied.

The U. S. Navy's first nuclear-powered surface ship, the "Long Beach", will introduce a radically new concept in defense capabilities. She will operate offensively and independently of other forces under conditions of both nuclear and non-nuclear warfare against airborne, surface or under-sea opposition. In addition to equipment and weapons for detecting and destroying enemy submarines, she will carry the Navy's modern guided missiles.

The piping for the atomic reactors being designed and developed by the Westinghouse Electric Corporation will use a large number of special heavy wall stainless steel Midwest Welding Elbows. This is not the first atomic project for which Midwest Welding Fittings have been used. In fact, when the nuclear propulsion program first began, Midwest furnished special welding fittings for the "Nautilus" prototype installation at Arco, Idaho.

Whether or not you are concerned with nuclear power, Midwest Welding Fittings (both stock and specials) will do a better job for you. Ask your Midwest distributor or write us for Catalog 54, which tells you why.

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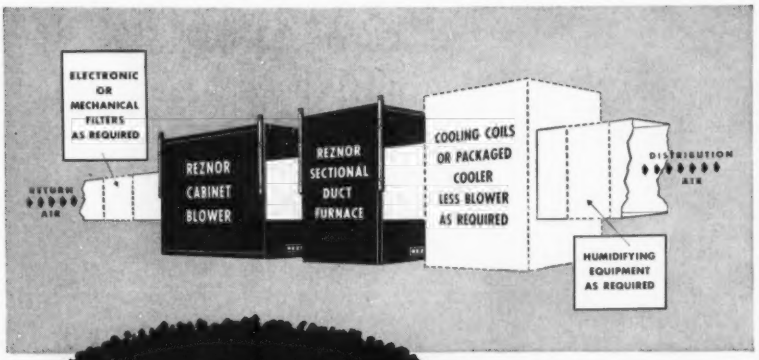
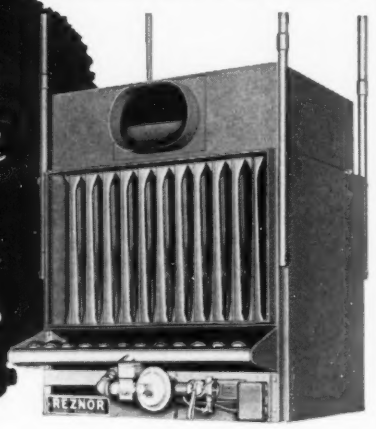
7918

MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS


ELECTRONIC OR MECHANICAL FILTERS AS REQUIRED
RETURN AIR
REZNOR CABINET BLOWER
REZNOR SECTIONAL DUCT FURNACE
COOLING COILS OR PACKAGED COOLER LESS BLOWER AS REQUIRED
DISTRIBUTION AIR
HUMIDIFYING EQUIPMENT AS REQUIRED

How to Match a Heating System to Exact Job Requirements



Reznor sectional duct furnaces free the designer from the limitations imposed by packaged heating equipment . . . equipment which can't be *exactly right* for any one job because it has to be *good enough* for so many different jobs.

A heating or heating-cooling system designed around a Reznor duct furnace can be matched to exact job requirements. Each duct furnace is a compact, highly efficient heat exchanger with a full set of operating controls. All other components,—for air moving, cooling, cleaning and moisture control—are separately specified and installer-supplied. Only those components which are necessary on the particular job need be included, with each individually selected to fit that one job.

Sectional assembly (a completely new concept in duct heating equipment) completely eliminates the installation problems which formerly prevented the use of large capacity custom-engineered duct heating systems. With the Reznor Series DS sectional duct furnace, systems with capacities in excess of 2,000,000 Btu can be assembled on the job from sections weighing no more than 315 pounds. Each of four basic sections—150, 200, 250, and 300 thousand Btu—is complete with controls and is provided with its own built-in draft diverter, flue connections and mounting pipes.

If you aren't taking advantage of the design flexibility of Reznor sectional duct furnaces, you're missing a good bet on many of your commercial, industrial and institutional jobs. Don't delay getting all the details on this versatile line of heaters. Give your nearby Reznor distributor a call—today.

REZNOR
WORLD'S LARGEST-SELLING DIRECT-FIRED UNIT HEATERS
Reznor Manufacturing Co.,
78 Union St., Mercer, Pa.

for complete details,
wherever you are . . .

Look for Reznor under "Heaters-Unit" in the Yellow Pages

in the adjoining State of Madras under the Neiveli project. Cost will be less than 1.6 mills a unit.

A 7100-ft masonry dam (75-million cubic feet of masonry) about 180-ft high, over the bed of the Sharavati River, is to be built at Linganmakki, 4 miles north of Jog Falls. At the same site a power plant with a generating capacity of 44,000 kw will be erected.

The reservoir will have a capacity of 178,000-million cubic feet of water. The water will flow into a power channel through two under-sluices to be installed on the left flank of the dam. The open channel will run about 3 miles.

A 3290-ft tunnel will be cut as a continuation of the channel, and water from the tunnel will join the Talakalale stream in a balancing reservoir. From this reservoir the water will flow on to a forebay through a "pressure" tunnel 3150-ft long. Ten sluices will be provided.

A generating station will house ten units of 89,100 kw each, and a high-tension transmission line will connect Shimoga and Bangalore with stepdown stations to be linked with the present Mysore grid.

The project's first stage – installation of two units of 89,100 kw each – is expected to be completed by 1960-61 at an estimated cost of $48 million.

Originating from the Western Ghats in Shimoga district, the 88-mile-long Sharavati River flows some 64 miles through steeply inclined terrain into a 900-ft deep gorge at Jog, where the 120,000-kw Mahatma Ghandi hydroelectric station now operates at full capacity. The Sharavati collects water from a 800-square-mile area, all of which is steep, heavily wooded mountains with an average rainfall of 75 to 300 inches annually. Thus kwh costs will be cut down.

Development of the Sharavati is said to be the "most economical" project in India. Cost per kw is expected to be not more than $115, and the capacity of the plant to be 930,000 kw. Gross revenue from

Here's Why...

Silicone Insulated Drive Motors Give Reliability At Lowest Cost

When reliability is a must . . . when essential auxiliaries have to keep going twenty-four hours a day, year in and year out despite temporary overloads and high ambients . . . that's when it pays to have drive motors that are insulated with heat-stable Dow Corning Silicones.

Utility engineers report that silicone insulated auxiliary drive motors carry 30% to 50% overloads without "strain or pain". That's because the thermal stability of Dow Corning Silicones means greater service factor than is possible with any other insulation.

And silicone insulated motors operate at lowest cost because motor horsepower can be matched to normal load. When operating at full load efficiency, there's still plenty of reserve for overloads. You save money on power costs and maintenance, too.

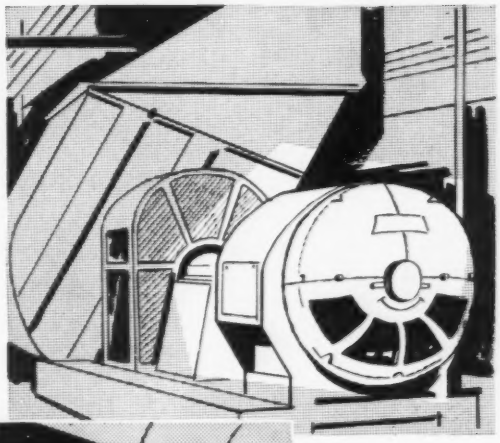
What's more, silicone-insulated motors survive other power plant hazards, such as water, steam, dust, fly ash, cinders and similar motor-killing contaminants.

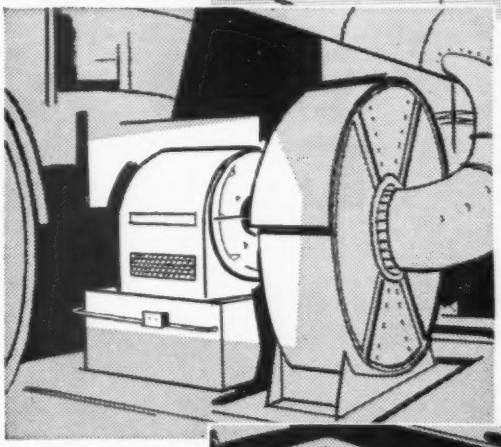
Most leading manufacturers now offer silicone-insulated motors in a wide range of sizes for power plant service. **Reliability costs less with silicones.** That's why it always pays to . . .

Specify DOW CORNING SILICONES and *Save*

Write Dept. 105 for list of builders who offer Dow Corning silicone-insulated motors.

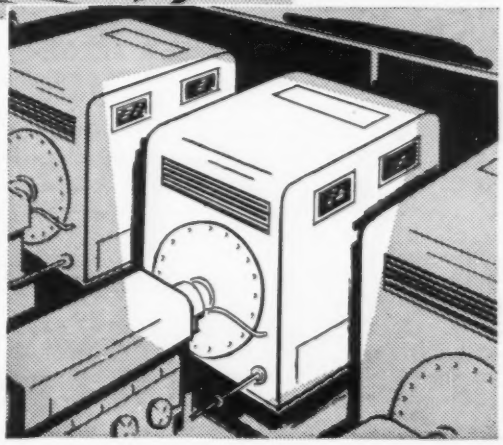
High ambients and temporary overloads are taken in stride by silicone insulated induced draft fan motors





Coal pulverizers and other essential auxiliaries operate more efficiently with silicone insulated motors matched to normal load

Self-protecting silicone rubber insulation in these boiler feed pump motors defies heat and moisture



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Dow Corning CORPORATION

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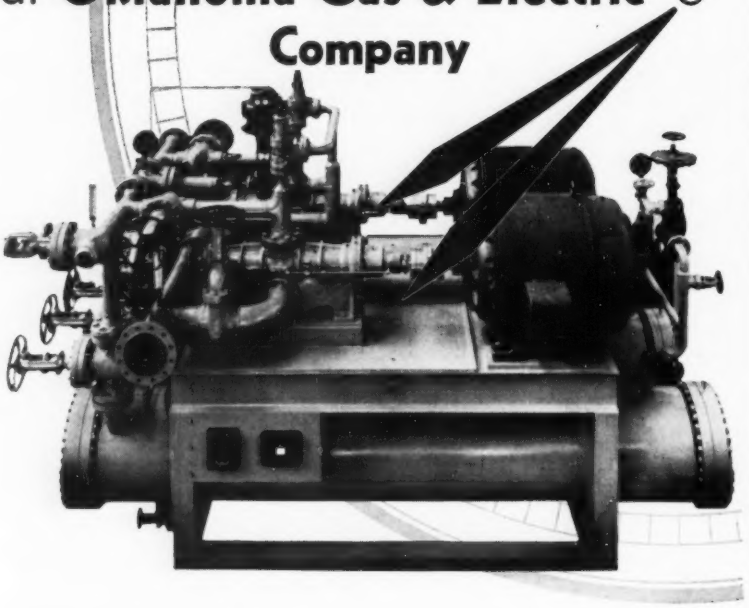
WARREN SCREW PUMPS
work 'round-the-clock
at Oklahoma Gas & Electric Company



Pumping heavy fuel oil

to the boilers at the RIVERBANK STATION of the
Oklahoma Gas & Electric Company
is a full-time job for these two Warren Screw Pumps (#5¼ Long Body)

For many months they have been providing 24-hour-a-day service at full efficiency for this important installation:

The heavy fuel is fired in a radiant type boiler with nominal steam capacity of 1,200,000 pounds per hour. The steam-driven turbo generator has a nominal capacity of 170,000 KW, and the turbine operates at 1800 PSIG and 1000°F. at the throttle valve, with reheat to 1000°F.

Operating temperature of the #6 Bunker "C" fuel oil is 100° to 225°F.; capacity is 225 GPM; discharge pressure is 675 PSIG; and using 150 HP—1150 RPM electric motors.

Warren Pumps are most important to the uninterrupted functioning of this installation. Like so many other power companies throughout the country, Oklahoma Gas & Electric Company is completely "sold" on Warren for long, dependable pumping service.

WRITE FOR BULLETIN 252

WARREN
CENTRIFUGAL · SCREW · RECIPROCATING · ROTEX
WARREN PUMPS, INC.
WARREN, MASSACHUSETTS

P-35

the project is expected to be $6.3 million annually, when the first two generating units are completed.

New Bridge in India

India's longest prestressed concrete bridge, spanning the Coleroon River, recently was opened to traffic. The new bridge has a waterway of 2070 feet, a roadway 22-ft wide, and 2- and 5-ft footpaths.

This is the first road bridge in India using the Freyssinct prestressing system, which saved sizable amounts of steel and cement.

The bridge uses no staging or support from the riverbed. The 60-feet-deep concrete foundations stand on sand over clay. Abutments and piers are brick and cement.

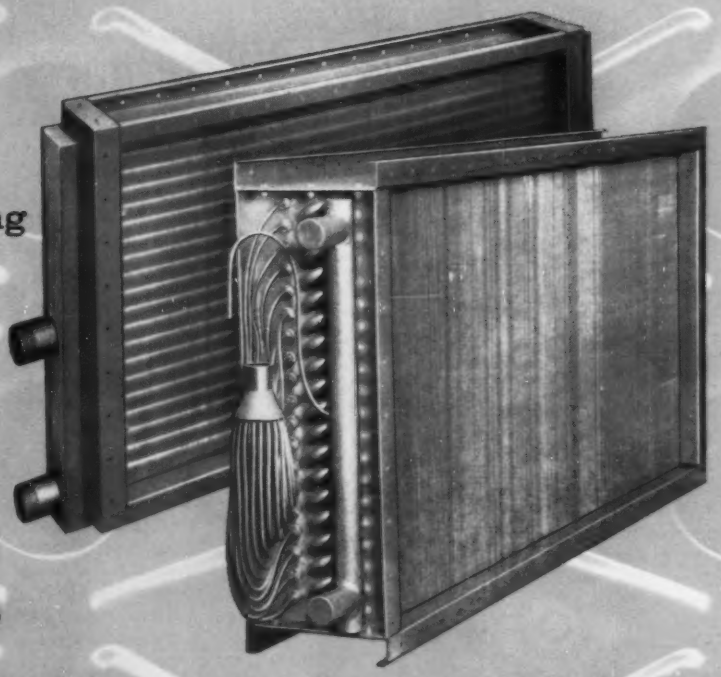
Western News in Russia

The startling Soviet advances in technical and scientific matters has resulted in large measure from a planned system of training scientists. One aspect has been largely overlooked: the part played in Soviet advancement by Western technical information disseminated throughout the USSR. The Soviet Union is gaining far more from scientific information published in the United States and Britain than vice versa. The reason for this is that while English is widely taught in Soviet schools training future scientists, there is a dearth of trained translators in America to handle Russian-language technical publications. Proceedings of the Soviet Academy of Sciences, for instance, are available only in Russian and there are few, if any, organizations in America translating such material.

Conversely, practically all Western technical information in English and in other languages is processed by special Soviet organizations and the result, in digest form, disseminated throughout the USSR. The Russian Scientific Information Institute, under the auspices of the USSR Academy of Sciences, set up in 1953, issues regularly Russian translations of scientific informa-

When you need heating and cooling coils...

these are better



because of this!

Air Activating Guides

This Westinghouse fin design activates air ... does away with dead-air film

All Westinghouse continuous Plate-Fin Coils feature:

- *Permanent Mechanical Bond—Fin to Tube*
- *Minimum Air Resistance*
- *Guaranteed Published Performance*
- *Wide Selection*

And for heavy-duty industrial process and high-pressure steam heating . . . standard sections with extra-heavy wrought-iron finned pipe are available.

Call your Sturtevant Division Sales Engineer for complete details on your heating and cooling coil requirements, or write Westinghouse Electric Corporation, Department E-1, Hyde Park, Boston 36, Massachusetts.

J-80654

YOU CAN BE SURE...IF IT'S Westinghouse

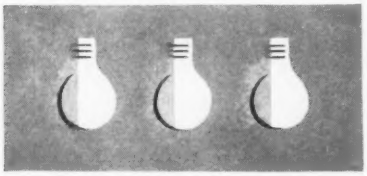
HYDRO-FILTER

Hydro-Filter Highlights of: DUST CONTROL DOINGS

Dust Control problem of light bulb manufacturer is brought to light

The Problem:

A leading manufacturer of light bulbs wanted to build a new manufacturing line but was plagued by problems they had experienced with an existing wet scrubber. *No wonder* . . . powdered glass, broken bulbs, colored ceramic frit, alcohol and resins are used in the process and the line must operate 24 hours a day—7 days a week. A shutdown on the dust collector would mean a shutdown for the entire operation because of dust and noxious fumes. As a result, only two scrubber manufacturers would bid on the job.



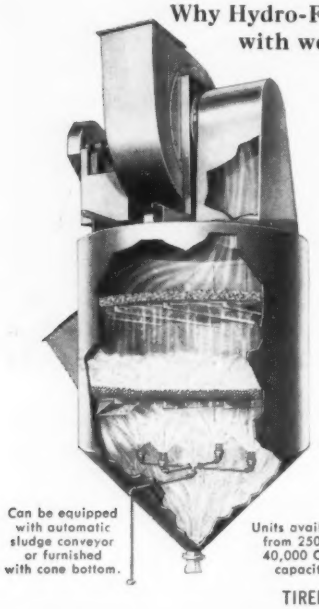
The Solution:

A type I Hydro-Filter with automatic sludge conveyor was selected for the job after customer evaluated evidence of its efficiency on the basis of (1) ability to operate at rated efficiency over prolonged periods at heavy dust load; (2) ability to operate over prolonged periods without shutdown for maintenance.

The Result:

Hydro-Filter did the job, and more. After 6 months operation the company ordered their *second* Hydro-Filter.

Why Hydro-Filter combines exceptional efficiency with welcome ease of maintenance:


Can be equipped with automatic sludge conveyor or furnished with cone bottom.
Units available from 250 to 40,000 CFM capacity

Air, water and glass spheres do the work in Hydro-Filter. There are no moving parts in the collection area. No baffles; nothing to load up and no "dead" areas to make cleaning a chore and efficiency a *myth*. The relatively simple design permits economical use of special materials of construction. It is designed to operate on dusts, sprays, fumes, and mists and can be equipped for recirculation of the liquid scrubbing medium.

Hydro-Filter will maintain a constant high level of efficiency over wide variations in volume of air and heavy dust loads. And because of its simple design, it will provide ease of maintenance *unmatched by any equipment* for similar use.

Write for descriptive bulletin today.

TIRED OF DUST COLLECTOR MAINTENANCE?
. . . YOU'RE READY FOR HYDRO-FILTER

HYDRO-FILTER

National Dust Collector Corporation

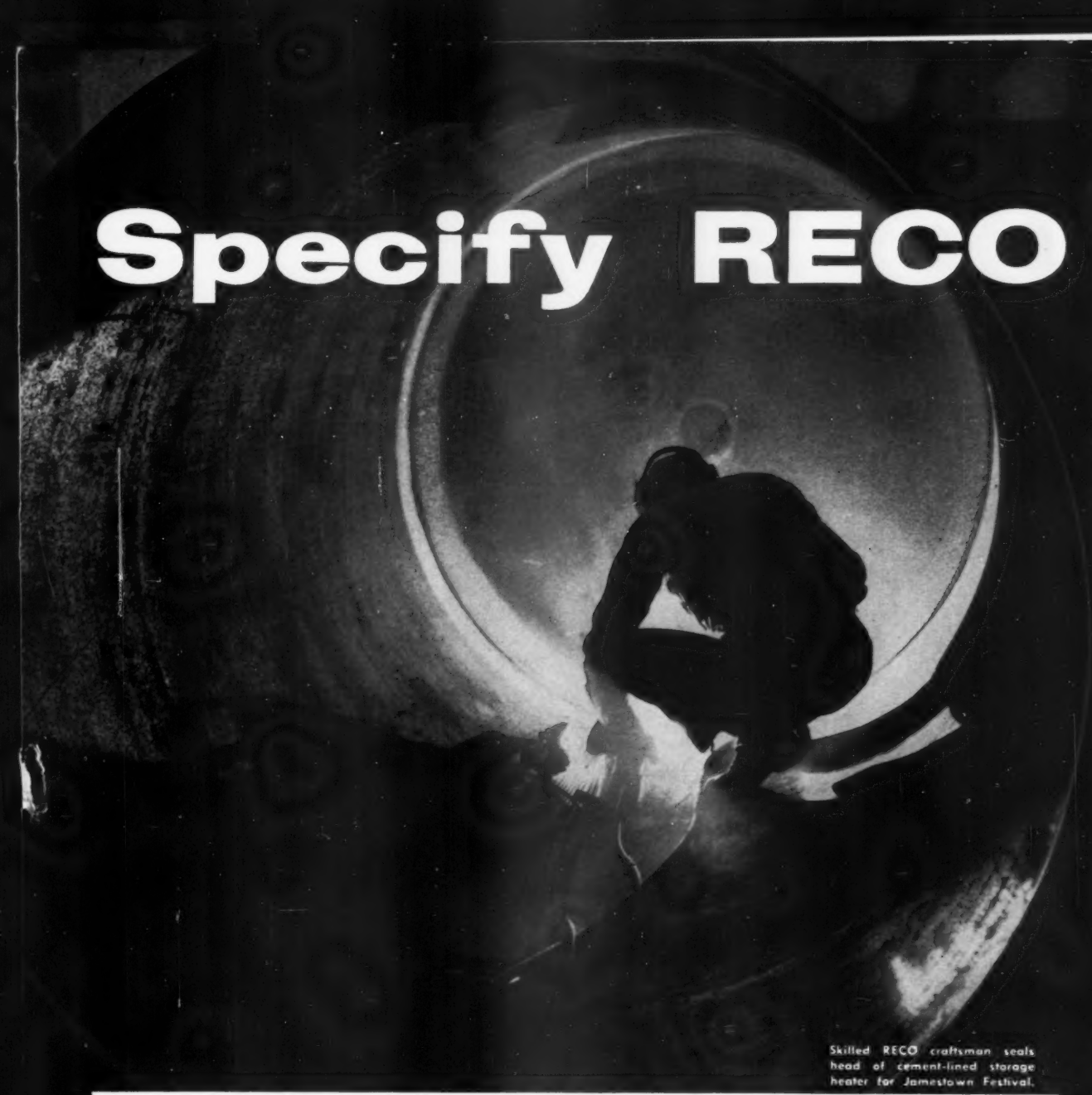
606 Machinery Hall Building • Chicago 6, Illinois

tion from all parts of the world. In 1956 the Institute was issuing separate periodicals on mechanical engineering, electrical engineering, metallurgy, and geology, and has since added civil engineering and mining. According to an announcement over Moscow Radio the aim is to process 9000 foreign periodicals regularly, for which 11,000 Soviet experts will be needed. In addition the Institute began publishing in 1956 a special technical digest "Express Information" covering 21 branches of technology, containing information on latest developments, photographs, diagrams, and such received within the preceding 10 days. In addition the Institute has issued special surveys on space travel, television in industry, electronic computers in industry and commerce. For archives the Institute prepares microfilms and photostatic copies of entire scientific treatises as they are published in the original. According to a Moscow report in 1956, some 1500 translators were employed on the work.

United States literature receives special attention. Last June 20 Soviet publishing houses were issuing papers by U. S. scientists in various branches of science, and the Foreign Literature Publishing House in Moscow published a series of papers, in Russian, issued by the U. S. Atomic Energy Commission prepared for the Geneva Conference on Peaceful Uses of Atomic Energy. The series included all volumes of the American edition except the fifth, which covered the same ground as a similar Russian publication. In this work U. S. publishers have been very helpful. The Soviet Academy of Sciences exhibition of U. S. books in Moscow last May contained contributions from 50 major U. S. publishing houses and more than 20 universities, including Columbia, Princeton, Harvard, and Yale.

Atomic energy is being given special attention in a magazine called "Atomnaya Tehknika za

Specify RECO



Skilled RECO craftsman seals head of cement-lined storage heater for Jamestown Festival.

VIRGINIA'S JAMESTOWN FESTIVAL
Architects & Engrs.—Dalton & Justice, Richmond, Va.
Plumbing Contr.—Service Plumbing and Heating Co. Williamsburg, Va.
General Contractor—John W. Daniels, Danville, Va.
Heating & Plumbing Jobber—Noland Co., Inc. Newport News, Va.

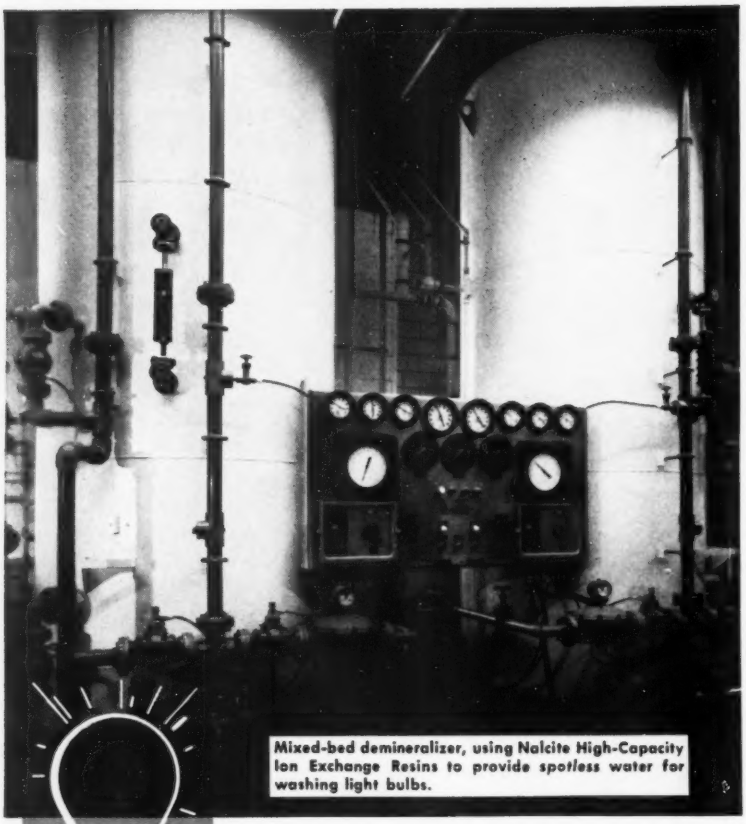
RECO Makes Hot Water History at Virginia's Jamestown Festival Park

More than two million visitors will walk back through history this year at Virginia's Jamestown Festival Park. But they will never be more than a few steps away from the comforts of today. A RECO cement-lined hot water storage heater keeps plenty of piping hot water always on tap in the festival's group of administrative buildings — the Reception Center, Gift Shops, Restrooms, and Mermaid Tavern. For these same buildings, a RECO convertor supplies hot water for the forced circulation, modular type heating system.

For guaranteed quality, fair price and quick delivery on *your* next heating job — SPECIFY RECO.

Write for free catalogs and name of RECO representative nearest you today: RECO, Dept. P, 7th & Hospital Sts., Richmond 5, Va.

RICHMOND ENGINEERING CO., INC.


Mixed-bed demineralizer, using Nalcite High-Capacity Ion Exchange Resins to provide *spotless* water for washing light bulbs.

BRIGHT IDEA!

for spotless light bulbs

Nalcite® **DEMINERALIZED WATER**

Highest quality demineralized water is needed to wash light bulbs to sparkling spotlessness for this major manufacturer . . . Nalcite Cation and Anion Exchange Resins, working in a modern mixed-bed demineralizer, do the job here — as they can do it on any water that needs upgrading for most efficient use.

Whether you want to wash a light bulb or get better boiler feed water, Nalcite Exchangers have capacity, stability and other performance advantages you should know about.

NEW WATER CONDITIONING HANDBOOK

Sixty pages of concentrated data and useful tables on water conditioning with Nalcite Ion Exchangers. Your copy free on request. Ask for Bulletin Z-5.

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Rubezhom" (Atomic Energy Abroad), which features translations of foreign works, reviews, and papers on the key branches of nuclear science. The very first issue (November 1957) contained a review of U. S. achievements in atomic energy and use of isotopes.

Apart from the information disseminated from Moscow, each Soviet republic has an information center. The Byelorussian, Georgian, Kazakh, and Uzbek republics have publications carrying foreign developments. In the Uzbek republic, Soviet and foreign technical material is disseminated by the Institute of Scientific-Technical Information and Propaganda.

The organization of this tremendous program carries a lesson for the West that it is not enough to produce scientists and build laboratories alone; it is equally important to keep abreast of the developments in international science to gain the maximum benefit from others' work.

Rock-fill Dams in Australia

Engineers claim that rock-fill design has slashed construction costs of new dams at Mount Isa and Mary Kathleen, major mining centers in Queensland, Australia. Both dams were designed by the Australian consulting engineer firm of Gutteridge, Haskins & Daven; construction by Theiss Bros. Pty., Ltd.

The Mary Kathleen dam, the first built, is 75-ft high and 200-ft wide at the base, with a crest of 550 feet, and contains 115,000 cubic yards of rock excavated from the spillway at the right abutment.

The Mount Isa dam is 87-ft high with a base width of 250 feet and a crest width of 950 feet. This dam required 195,000 cubic yards of rock fill; 95,000 cubic yards came from the spillway on the dam's left abutment.

Shell Fish Market Piles

Steel shell piles 90-ft long are used to support the new Melbourne, Australia fishmarket. The long piles were suggested by Cyril J. E. Hid-

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Portsmouth: Mass. Gas & Elec. Light Co.
NEW JERSEY
Atlantic City: Franklin Elec. Sup. Co.
Camden: Camden Elec. Fix. Co.
NEW YORK
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La Crosse: W. A. Roosevelt Co.
Milwaukee: Lappin Elec. Co.
Standard Elec. Sup.
WASHINGTON
Seattle: Seattle Lighting Fix. Co.
ALASKA—*Anchorage:* Northern Supply Co.
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This precision-engineered modern module is Lightolier's newest solution to the problem of efficient, evenly diffused lighting for public and commercial interiors. It is designed for swift installation in the modular pattern of almost all suspended 2′ x 4′ acoustical and plaster ceilings. The clean-lined structural vinyl diffuser† spreads optimum glare-free illumination over a broad area. It swings down on hidden hinges for speedy, economical cleaning and relamping. Available in 2′ x 2′ and 2′ x 4′ sizes for individual, continuous or pattern mounting. For more detailed information, write to Jersey City 5, New Jersey or see the authorized distributors listed on this page.

†Pat. Pending

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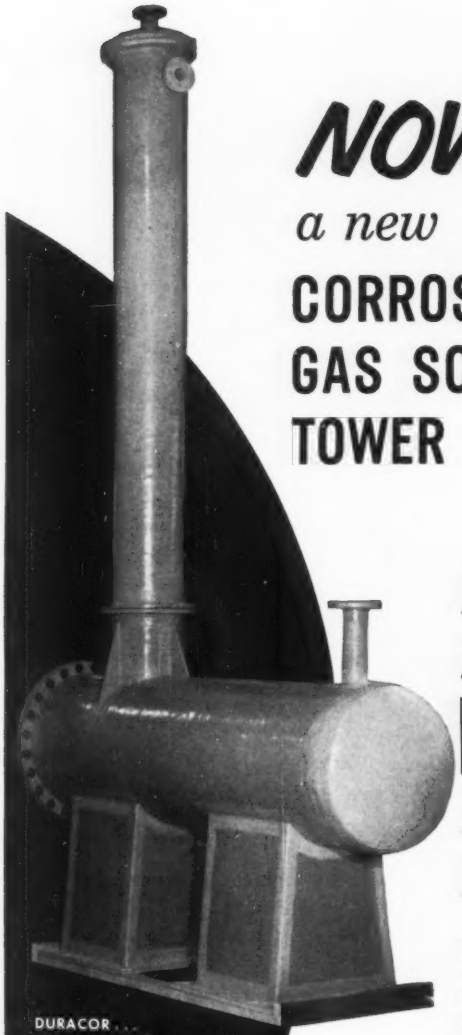

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CORROSION-PROOF GAS SCRUBBING TOWER

fabricated from

DURACOR

Reinforced Plastics

DURACOR . . .
Tensile Strength:
11-15,000 PSI
Flexural Strength:
20-30,000 PSI
Resists many acids, alkalies and solvents.

PROBLEM: A large zirconium producer needed a material to withstand corrosive gases entering scrubbing towers at +300° F.

SOLUTION: Working from customer specifications, Ceilcote engineers designed and built this unit — base, body and tower — *completely from* DURACOR.

RESULT: DURACOR now provides long life and maintenance-free operation in handling HCl gases and chlorine.

WHAT'S YOUR PROBLEM? DURACOR resists practically any corrosive gas, fume or liquid . . . offers unlimited applications because it can be fabricated to any shape. Write today and tell us about your requirements.

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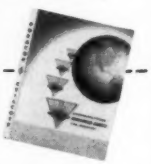

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4872 Ridge Road • Cleveland 9, Ohio
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NAME _____
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CITY _____ ZONE ____ STATE _____

speth & Associates, consulting engineers, and Frankpile Australia, Ltd., when it was found the surface was rubbish fill, and, down to 78 feet, silt over gravel.

Giant Garage

The first multistory garage in Medellin, Colombia will be erected this year. Consulting engineering firm Jaramillo, Wills, Cordoba & Cia. Ltda. designed the 7-story reinforced concrete building.

Cars will drive on ramps between floors: up ramps are inclined 20 percent, down ramps have a 15-percent slant. The garage will have facilities for complete automotive service, plus a 50-cubic-meter water tank on the roof.

For design purposes, the building has been divided into two equal halves along its long axis, with central beams and two cantilevers at the extremes.

Colombia Contractor Cabal

Colombia contractors have formed the Camara de la Construccion to represent their 1.2-billion-peso building industry. Sparked by Dr. Jorge Restrepo-Uribe, ex-mayor of Medellin and manager of one of the largest contractor firms in Colombia, the Camara already has 180 affiliates in Bogota (divided between building material manufacturers and contractors), 150 in Medellin, and 120 in Cali.

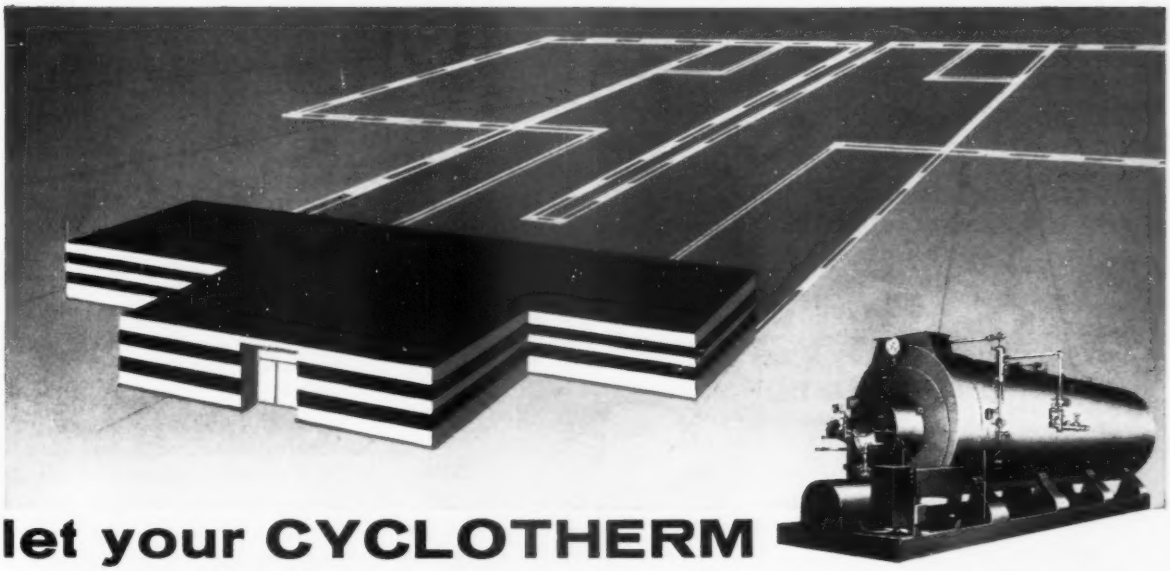
Camara manager Dr. Alberto Gonzales-Ortiz says the organization's main activities will be to obtain financial credits, organize joint enterprises financed with Colombian and foreign capital, defense of the building industry, and other problems connected with the 40 percent boost in construction costs last year.

The Camara plans to establish the Banco de la Construccion by mid-1958, with an initial capital investment of $20 million.

High Highway

A direct new highway connecting Bogota and Medellin will slash

For a five year plan or a fifty...



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How much steam will you need five years from now? Or ten? It's easy to blueprint your steam generating future with Cyclotherm Steam Generators. Cyclotherm permits you to add boiler horsepower as you need it. Units from 18 to 750 HP, in 18 sizes. You can add Cyclotherms to your steam capacity like a child adding blocks to a house.

The Cyclotherm is particularly well adapted to multiple installations. It's compact—takes up to one-third less space than other package boilers. It needs no excavation, no foundation. A simple flue takes the place of a towering stack. Completely assembled before shipment, the Cyclotherm is a working unit the minute it reaches your plant. And one manufacturing responsibility stands behind the entire equipment—boiler, burner, instrumentation and all.

Cyclotherm's Cyclonic Combustion guarantees a minimum of 80% efficiency in only two passes. Larger units operate at from 30% to 100% of rated capacity without losses of efficiency—smaller units operate on or off automatically as load requires. Maintenance costs cut as much as 50%. And the world-wide Cyclotherm service organization is always at your disposal. We'd like to plan your steam-generating future with you. Remember too that Cyclotherm is the only manufacturer who has specially designed a complete line of hot water boilers, output per hour from 670,000 to 6,700,000 BTU. Fill out the coupon and a Cyclotherm sales engineer will call.

At J. D. Jewell . . .
One Cyclotherm in 1949;
Five Cyclotherms Today

One of America's largest chicken processors is J. D. Jewell, Inc. (Jewell Whole Cut Up Chicken, Jewell Chicken Pie, etc.) of Gainesville, Ga. And here's how Jewell's growth has been matched by Cyclotherm installations:

1949	100 HP Cyclotherm
1954	150 HP Cyclotherm
1955	18 HP Cyclotherm
1956	80 HP Cyclotherm
1957	150 HP Cyclotherm

And when Jewell processes more chickens, it wil have more Cyclotherms to help process them!

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IN STEAM
GENERATION
CYCLOTHERM®
STEAM AND HOT WATER GENERATORS

A Division of National-U.S. Radiator Corp., Oswego, N.Y.

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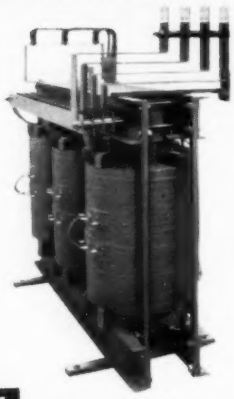
Please send me your booklet *Cyclotherm Cyclonic Combustion*, also rotogravure copy of *Cyclotherm Sales Steam* with illustrations and descriptions of Cyclotherm installations.

another quiet **HEVI-DUTY** *installation*

300 KVA
4160 208Y/120 volts
DRY TYPE TRANSFORMER



PLACE: Student Union Building, Alabama Polytechnic Institute, Auburn, Alabama

ARCHITECT: Pearson, Tittle and Narrows, Montgomery, Alabama

GENERAL CONTRACTOR: Batson-Cook Co., West Point, Georgia

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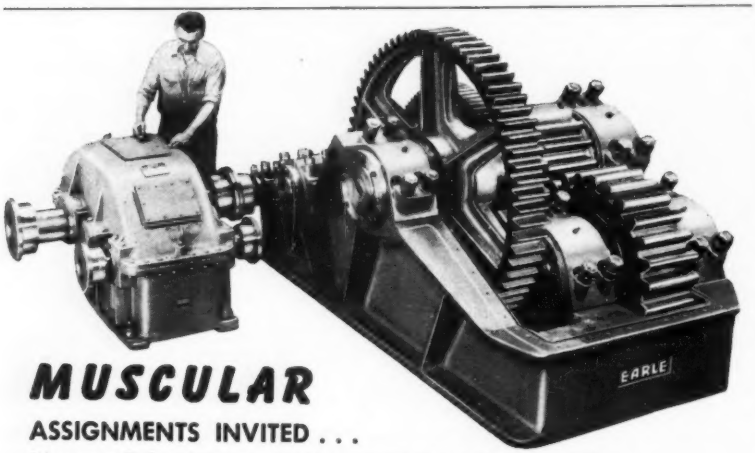

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The muscle we speak of is the mighty power of the machinery we make, designed to lift or move the heavy burdens of industry. Special operating mchanisms, speed reducers, special machinery for hoists, for sewage disposal plants or sugar refineries are all routine at Earle. "The tough jobs go to Earle" and if you have a comparable "muscular assignment" in view, try us! Indicate your needs on the coupon below.

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☐ Please send me your catalog on bridge operating equipment.
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Name_____
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driving time between Colombia's two largest cities to 8 hours. The old route, over sinuous mountain roads, was only 360-miles long but took two days to drive.

The 102-mile eastern leg, started in 1956, runs from Bogota to Puerto Salgar, on the Magdalena River. Paved width of the highway is 23 feet, with bank width 32 feet. Surveys of the 120-mile western sector were started in early 1958. Surveying and construction is especially difficult because the road crosses the rugged spine of the Los Andes Mountains.

Total construction costs are estimated at $20 million, with half paid by the Ministerio de Obras Publicas, and the rest by the Antioquia and Cundinamarca departments (states).

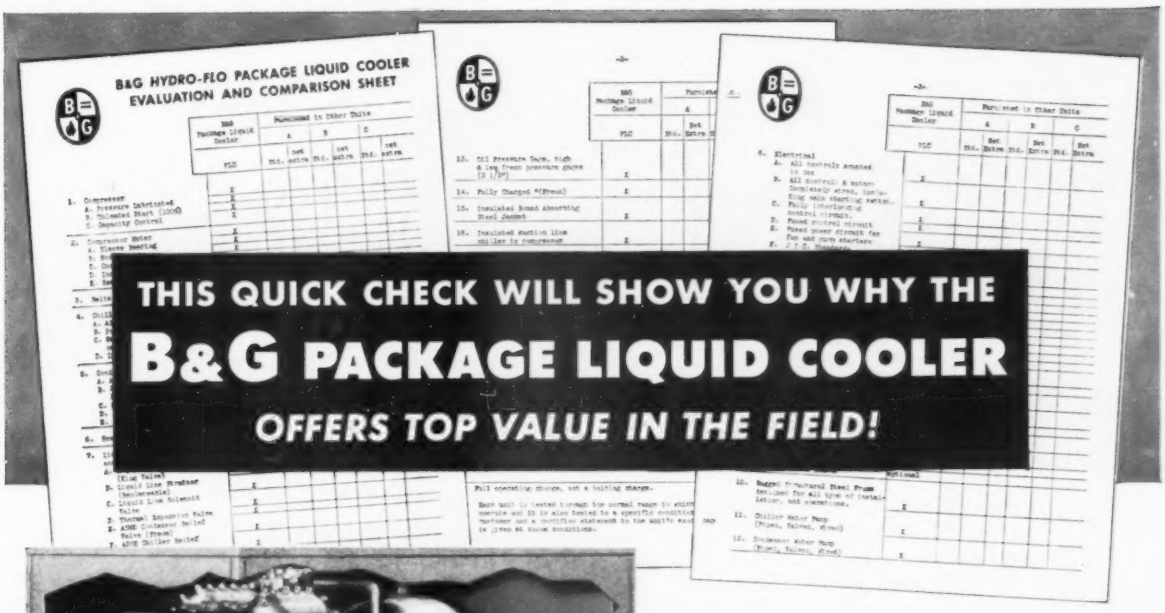
Cool Gas

The State Electricity Commission of Western Australia is planning construction of a gas-cooling plant at East Perth, Australia. The plant will remove moisture and gum-forming compounds of the liquid-phase type from manufactured gas before it enters the gas holders. Gas temperature will be reduced from 100 F and 100 percent saturation to an automatically controlled temperature of 35 F. The plant will consist of duplicate units, each capable of treating 4-million cubic feet of town gas a day.

Coal Gas

Britain's first plant for producing gas by hydrogenating oil or low-grade coal is expected to be operating by 1960, with a capacity of 7.5-million cubic feet a day. The $5.6-million plant will be at Partington, near Manchester.

Advantages of this new method of producing gas will be low production costs, flexibility of raw materials, and a gas of low toxicity, free of sulfur compounds, and available at high pressure. The high pressure means the gas can be transmitted economically over long distances without compression, so



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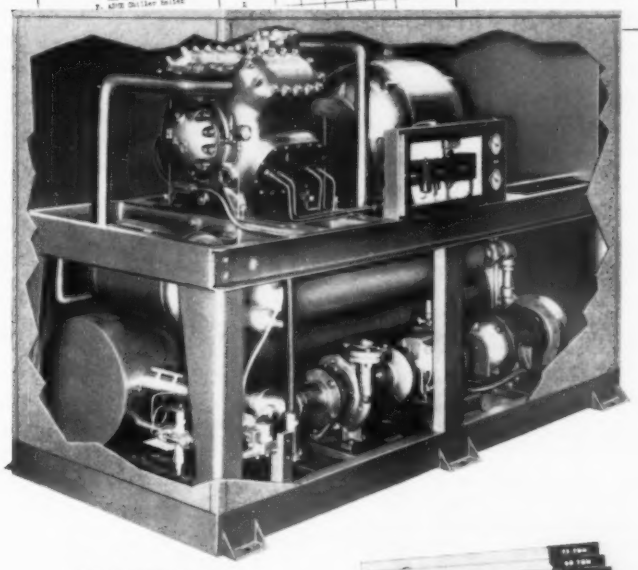


Send for a set of Evaluation Charts as illustrated above—compare the *standard* equipment of the B&G Package Liquid Cooler with that of any other. You'll see for yourself that *you can buy B&G quality at smaller installed cost!*

With this *completely packaged* unit, costs which might otherwise be charged against the job are eliminated. For example—

No inside wiring costs. The finest electrical controls are furnished, *completely wired and fully interlocked!*

No inside piping costs. Both chiller and condenser pumps are sized to specification, mounted, piped and electrically interlocked.

No structural framing costs. All equipment is mounted on a rugged steel frame—a permanent base.

No metal forming costs. Standard equipment includes a heavy gauge steel jacket with sound-deadening undercoating and Hammerloid finish.

No insulating costs. The suction line and heat exchanger are fully insulated.

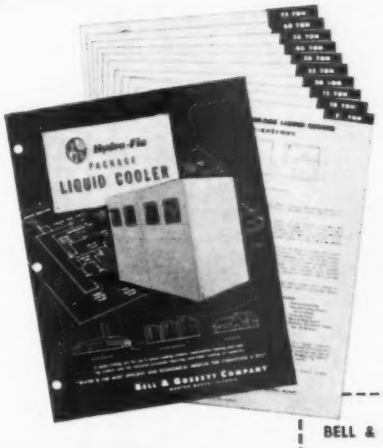
No testing costs. Fully tested under specified operating conditions and also under varying load conditions. All valves adjusted and balanced.

No extras to buy. Standard equipment includes gauges, compressor motor, all belts, driving sheave, compressor fly wheel, increment start, full sized heat exchanger and full operating charge of Freon.

Capacities: Ten units from 7½ to 75 tons

COMPLETE FILE OF SPECIFICATION AND APPLICATION DATA

Engineering data, specifications, evaluation charts, typical applications and prices on the B&G Package Liquid Cooler are included in this file. Send the coupon for your set.



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. . . WITH THE SAME MANPOWER!

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THE KEY TO ACCURATE FIELD TESTS FOR MOISTURE DENSITY IN EMBANKMENT AND FOUNDATION SOILS.

The DENS-O-METER is light in weight, compact, very portable, easy and economical to operate and maintain!

Developed after years of research by Department of Highways, State of Washington. Opens up entirely new possibilities for foundation and soils engineers and contractors who can now make accurate moisture-density and compaction tests, quickly and easily.

- *In small or large holes up to 3 ft. deep*
- *In all types soils and granular base materials*
- *In approximately 3 minutes after hole is dug*

CONTRACTORS AND ENGINEERS: Stop over-compaction, under-compaction . . . make moisture density determinations many times daily with a DENS-O-METER.

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production plants can be located where raw materials are cheapest.

Though the gas produced in this pilot plant will cost about the same as gas made by conventional methods, it is expected that gas produced in larger plants will be much less expensive.

New Railroad for Iran

Tabriz, second largest city in Iran, now has a direct rail link with Tehran, the political, financial, and industrial center of Iran, with completion of the 742-kilometer rail extension between the two cities.

Exports from Azerbaijan, the richest agricultural province in Iran, to Tehran and overseas markets via Khorramshahr will be made much easier and faster.

Work on the rail extension for the Iranian State Railways was started before World War II. A 431-kilometer sector between Tehran-Mianeh was finished then. Construction on the second link was started in 1954.

Power for Portugal

A huge thermoelectric power plant on the Douro River some 16 miles from Oporto, Portugal will support a hydroelectric power-distribution system in months of low water reserves. The initial installation will be a 50,000-kw steam electric generator. A second unit of the same capacity is included in Portugal's next 5-year development plan, beginning in 1959. A third unit of 100,000-kw capacity is planned.

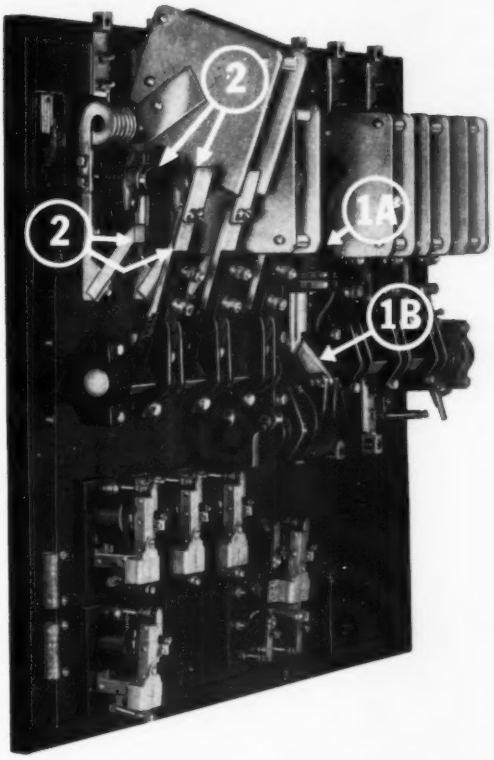
The steam plant will burn low-grade anthracite coal carried by overhead cable railway from mines at Sao Pedro de Cova and Pejao, 6 and 10 miles from the steam plant. The coal was once thought to have no economic value, but it now will be pulverized and burned with oil. Facilities for storing 500,000 tons of coal are located near the plant.

Panama Bridge

Construction of a $20-million bridge across the Panama Canal at Balboa is slated to begin in late

NO. 5 OF A SERIES

. . . WHY "Adequate Thermal Capacity" is vital in Automatic Transfer Switch design



The transfer switch must be designed with adequate thermal capacity so that, in case of a fault, the contacts will remain closed long enough for overcurrent devices to operate. Without this capacity severe damage to the transfer switch and other circuit elements may result.

The transfer switch should be capable of interrupting normal currents, including inrush or stalled rotor currents. It is not intended to open fault currents, nor is it designed for this purpose. Overcurrent devices on the service side of the Automatic Transfer Switch interrupt the circuit in the event of a fault.

High thermal capacity is particularly important in high K.V.A. systems where a fault results in extremely high currents. On such systems it may be necessary to select a transfer switch on the basis of short time rating rather than maximum load current (see chart)

TIME DELAY ON MOMENTARY OUTAGES

Recognition of the increased K.V.A. of distribution systems has led to development of the ASCO "Time Delay on Momentary Outage" feature supplied as a built-in component of the ASCO Transfer Switch. A switch equipped with this device will not open instantaneously under any conditions. In the event of a fault this device would prevent Transfer Switch operation until the overload devices have cleared the circuit.

ELECTROMAGNETIC EFFECTS

The configuration of the contact structure is also vital in determining the ability of the switch to remain closed under fault conditions. During the interval when high currents exist, strong magnetic fields surround the conductors. These magnetic fields tend to open the contacts. With the ASCO rugged mechanically-held design, no "contact opening" is possible.

SUMMING UP

Automatic Transfer Switches transfer the connected load from the normal to the emergency supply when normal fails or is substantially reduced. Upon restoration of normal the switches retransfer the load. The important differences between designs is that Magnetically Held Switches depend on adequate line voltage for holding power and tend to open under fault conditions causing serious damage. ASCO Electrically Operated, Mechanically Held Transfer Switches have the thermal capacity to remain closed until the circuit is cleared.

Here's why standard ASCO Automatic Transfer Switches have high thermal capacity to meet fault conditions

There is good reason why ASCO Switches rate high in thermal capacity:

1. **Power opening and power closing by means of momentarily energized coil (1A) and powerful linkages (1B) provide ample contact pressure at current carrying contacts.**
2. **Contacts (2) have the extra bulk required for high thermal capacity. This bulk dissipates heat quickly—important in preventing temperature rise and oxidation of contact surfaces with subsequent welding.**

Switch Size (Amperes)	Short Time Ratings* (Amperes)
	Not less than
30- 100	2,000
125- 300	15,000
400-1000	20,000

*Current which the switch can safely handle for one second.

Write for Publication 596 describing how to select Automatic Transfer Switches.

Automatic Switch Co.

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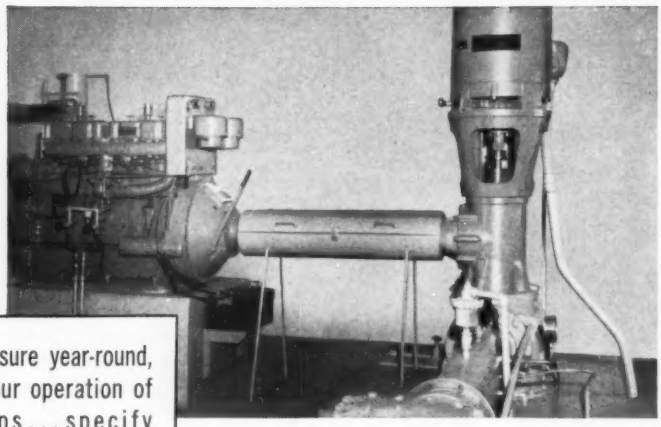

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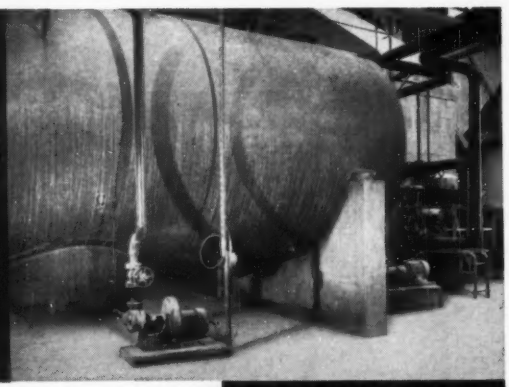
VIKINGS PUMP THICK SOAP



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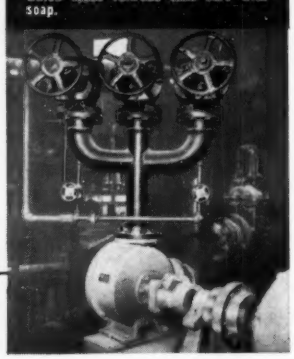
In their newly-enlarged Jacksonville, Florida, mill, St. Regis Paper Company installed the most modern, efficient equipment available. Included are three heavy-duty Viking Pumps to handle black liquor soap skimmings. This soap is thick and viscous, yet only two model LQ212 Vikings pump 25,000 gallons a day into two separating tanks. And one model M381 Viking loads 12,000-gallon tank cars in approximately one and a half hours. You see, Vikings are built for rugged pumping.

If you have to move thick liquids, we'd like to help. Write now for bulletin Section CP.

One of the model LQ 212 Viking Pumps connected to soap tanks.

Below, model M 381 Viking Pump, which loads railroad tank cars with soap.



VIKING PUMP COMPANY

Cedar Falls, Iowa U.S.A. In Canada, it's "ROTO-KING" pumps

See Our Catalog in Sweets Industrial Construction and Plant Engineers File.

1958, with completion planned for 1962. The bridge will run diagonally across the present ferry route, with exits in Panama and Ancon.

The bottom of the 11,000-ft bridge will be 201 feet above the high-water mark. The bridge will have three approaches: two 12-ft lanes and one 10-ft slow lane for trucks and buses. The bridge itself will have two 11-, two 10-ft lanes.

Brazil Pulp Mill

The first completely integrated bleached kraft pulp mill in Brazil is slated for completion in early 1959. The mill, located in Mogi Guacu, Sao Paulo state, will have a complete chemical recovery unit and its own caustic soda production facilities. Initial capacity will be some 150 tons a day of bleached kraft pulp manufactured from eucalyptus. The pulp will be sold on the domestic Brazilian market.

Most of the machinery and equipment required for the mill has already been delivered in Brazil. Clearing, grading, and other earth-moving operations are under way at the mill site, and construction is expected to begin within the next few weeks.

The mill is designed by Canadian consulting engineers Stadler, Hurter and Company. Christiani-Nielson Company will erect the mill and install the machinery.

Engineers Consider Association

India engineers are mulling a proposal to secure statutory recognition and formation of a central body to encompass the Institution of Chemical Engineers, Institution of Telecommunication Engineers, Institution of Engineers, and other like organizations

The Institution of Engineers asked for statutory recognition, but the India Law Ministry stopped this, saying that since the Institution had no definite function, a bill to give it statutory recognition could not be passed by Parliament. Compulsory registration was considered but given up as not necessary ▲▲

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Practices in design and construction make Flexitallic Gaskets different from others in the spiral-wound industry. In Flexitallic Gaskets, the compression characteristics for a given pressure series are *always* related to the bolting load for that series.

Once the design is right for a given service, Flexitallic Gaskets are made under exacting mechanical controls to assure that manufactured gaskets conform to specification.

The blue dye in the Canadian asbestos filler indentifies Flexitallic Gaskets for engineers who want the right gasket for each sealing requirement.

Whatever the service conditions may be—vibration, weaving, thermal and mechanical shock, and other joint stresses—the precision design and construction in Flexitallic Gaskets are your assurance of satisfactory service.

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*Flexitallic is a registered tradename. No one else can make a Flexitallic Gasket. Look for *Flexitallic Blue* — it's our exclusive blue-dyed Canadian asbestos filler.

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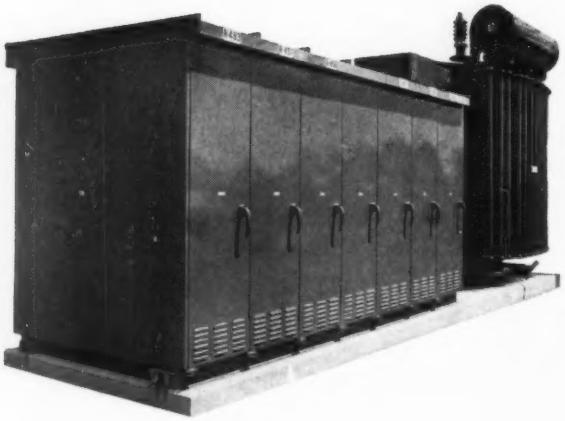

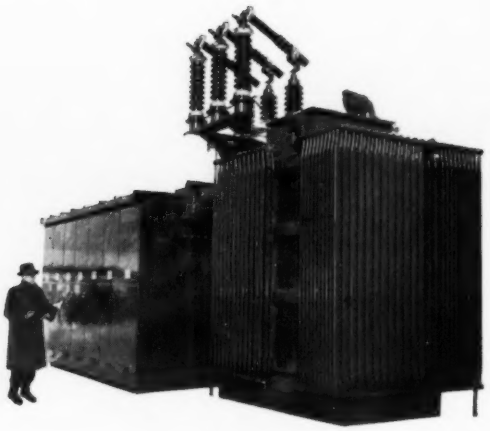

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Look around you today. You will see more I-T-E PRIMARY UNIT SUBSTATIONS going into service everywhere—in places where orders are placed after careful evaluation of several different makes. The growing trend toward I-T-E substations reflects the response of shrewd buyers to I-T-E's standing policy of giving more value for no more money. I-T-E engineers work with you in the planning stage . . . custom design the station to meet your particular requirements . . . skillfully arrange I-T-E's quality components into an efficient unit that gives you the maximum value for the minimum investment . . . make deliveries to meet your construction schedules. Make I-T-E your dependable, single source for complete PRIMARY UNIT SUBSTATIONS.

For information, write I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada, Eastern Power Devices Ltd., Port Credit, Ontario.

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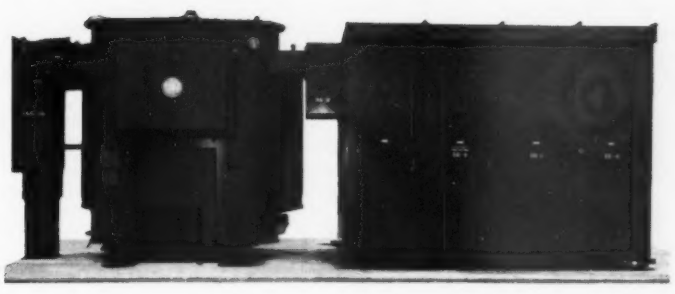

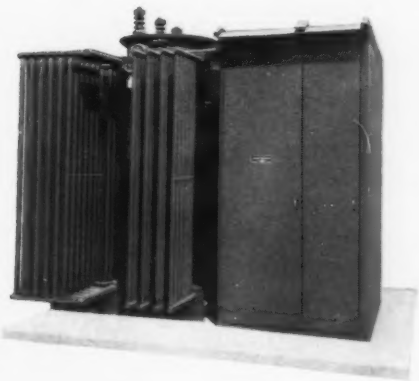

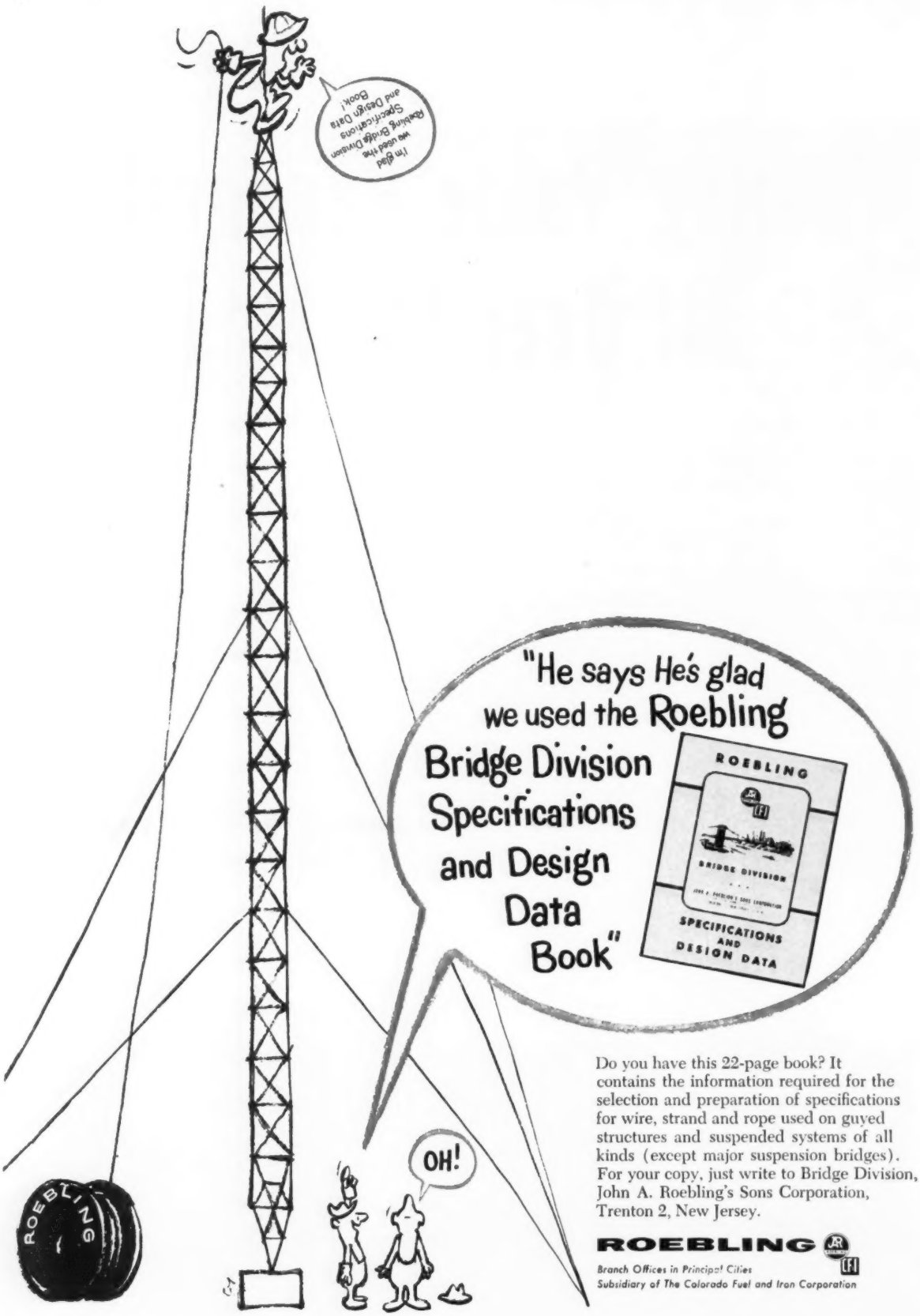
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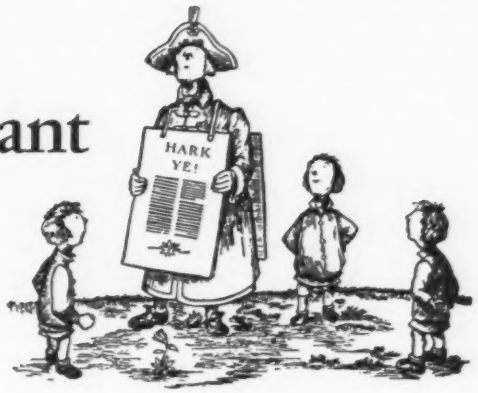
News for the Consultant



American Consultants to Visit European Engineers

Twelve American consulting engineers, eight of them accompanied by their wives, will board a TWA Super-G Constellation on Sunday, May 4, for a Consulting Engineers' European Tour. First stop will be London where a luncheon meeting is scheduled with the British Association of Consulting Engineers. This will be followed by visits, on an individual basis, to offices and projects in London and the surrounding countryside. Next stop will be Brussels for the engineering exhibits at the International Exposition as well as a luncheon with the Belgian Association of Consulting Engineers. The Belgian engineers also have arranged a cocktail party in honor of the American group, and visits to offices and projects are planned.

The same general program, with variations, will be followed in Berlin, Paris, Milan, and Rome, with several members of the party going on to Madrid and Lisbon for further meetings.

In Paris, Edward J. Wolff, of Edward J. Wolff & Assoc., Chicago, and president of Consulting Engineers Council, will join the party. Mr. Wolff plans to meet with officers of a number of European Associations of Consulting Engineers, and at these meetings he will study their methods of operation and explain to them the function of the Council in the United States. Following these meetings he will attend the Inter-

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The following pages bring you the latest developments in automatic controls from Honeywell. They widen your choice of products, give you more to work with.

For complete information on these new control products and systems, call your nearest Honeywell sales office. Honeywell provides 112 offices throughout the country; each is staffed with capable control specialists to assist you in preparing proposals and writing specifications.

Look over these new products and systems. And, remember, they are backed by the kind of support only Honeywell can offer you.

FOR MORE TO WORK WITH ... WORK WITH HONEYWELL

national Federation of Consulting Engineers (FIDIC) meeting, in Oslo, May 29-31, where he has been invited to be an official observer for the Council.

This is the second Consulting Engineers' European Tour sponsored by CONSULTING ENGINEER magazine. The first was in May of 1956, when a similar group of distinguished American engineers visited their contemporaries in private practice in England, Holland, Germany, Switzerland, and France. Much was gained in both a professional and technical way by the engineers on the first tour, and there is no doubt but that this currently scheduled tour will be of even greater value to the participants.

The engineers taking part in this tour are: Leroy F. Greene (Mrs. Greene), Sacramento, Calif.; Charles A. Munz, Temple City, Calif.; S. V. Applewhite (Mrs. Applewhite), New Orleans, La.; Walter E. Spotts, Reading, Pa.; Chester F. Mally, Ferndale, Mich.; F. R. Murray, Newport News, Va.; R. C. Johnson (Mrs. Johnson), Columbia, S. C.; E. Roger Hewitt (Mrs. Hewitt), Lansing, Mich.; Earl H. Beling (Mrs. Beling), Moline, Ill.; Hugh P. Duffill (Mrs. Duffill), Boston, Mass.; George F. Nicholson (Mrs. Nicholson), Long Beach, Calif.; and H. Fay Diehl, Harrisburg, Pa.

Hunter Hughes, Editor of CONSULTING ENGINEER, and Mrs. Hughes will accompany the group. Hughes made the arrangements for the luncheons with the European associations and for the individual meetings.

"Operation Hardtack"

Participating in the forthcoming nuclear weapons tests at the Eniwetok Proving Ground will be more than 3200 employees of Holmes & Narver, Inc., Los Angeles engineering and construction company. The figures were announced by S. P. Howell, manager of the firm's Atomic Energy Commission projects.

Howell indicated that the figures include over 3000 men on assignment at the Proving Ground, plus over 200 employees engaged in support activities.

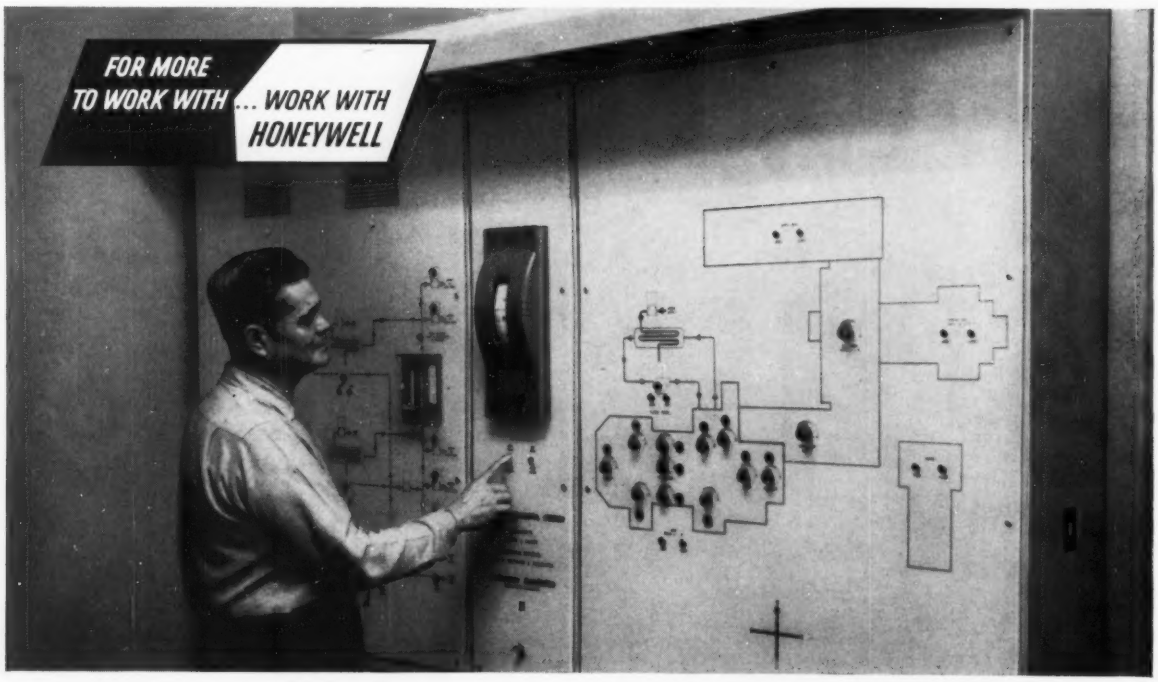
The forthcoming series, "Operations Hardtack," will advance development of weapons for defense. Also, information will be obtained on effects of weapons for use by military and civilian defense planners.

Another important objective of the test series will be the further development of nuclear weapons with greatly reduced radioactive fallout, thus restricting hazardous radiation to a military target.

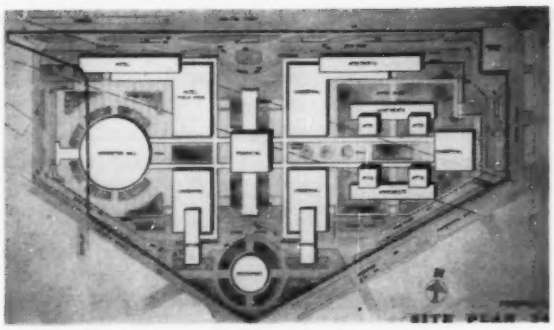
Boston to Get World's Largest Business, Civic, and Residential Unit

Plans for the erection in downtown Boston of the world's largest integrated business, civil, and residential center have been announced by Carrol M. Shanks, president of the Prudential Insurance Co.

Focal point of the extensive project encompassing over 31 acres – more than twice the size of New York's Rockefeller Center – will be a 50-story skyscraper.



Honeywell Supervisory DataCenter in St. Mark's Episcopal Church, Shreveport, is located in the building engineer's office, provides one-man control for air conditioning of parish property including hall, chapel and school besides the church. Owners: St. Mark's Episcopal Parish; Architect: Annan and Gilmer; Consulting Engineers: Paul Rottmann & Associates.



Two views of proposed downtown Boston business, civil, and residential center by Prudential.

It is planned to surround this 600-ft high structure with a 6000-seat municipal convention hall, a hotel that will be one of Boston's largest, a complex of garden and tower apartments housing about 4000 persons, a restaurant accommodating 800 to 900 patrons at a single sitting, and a great number of shops and specialty stores.

The project also will provide underground parking for 5000 automobiles.

The major part of the development will be situated on what are now the Back Bay Yards of the Boston and Albany Railroad. It is believed to be the largest single metropolitan site ever purchased for re-development. Acquisition costs will exceed $5 million.

Construction will begin as soon as detailed architectural drawings are completed. This will take about a year; the entire project will take nearly five years to complete.

The first structure to be erected will be the Prudential northeastern home office building containing 750,000 square feet of usable space. It will be the tallest structure in New England and will cost an estimated $50 million.

The buildings will occupy only 30 percent of the

Honeywell Supervisory DataCenter

increases efficiency, reduces air conditioning cost for any building—here, a church!

One of over 350* Honeywell Supervisory DataCenters sold throughout the country is illustrated on the opposite page. It provides supervision and control of the entire air conditioning system for St. Mark's Episcopal Church in Shreveport, Louisiana. One module of its panel shows the entire floor plan of the buildings with temperature check buttons and temperature adjustment knobs for eleven zones. Another module diagrams the entire hot and chilled water system, in color codes. A precision Tel-O-Set recording instrument located in the supply header flow diagram gives a continuous record of hot and chilled water supply to all units.

In this, as in all Supervisory DataCenter installations, the controls, instruments and central panel are manufactured, installed and guaranteed by Honeywell—a major central-control benefit only Honeywell can offer.

Working installations in all types and sizes of buildings across the country demonstrate clearly Honeywell's leadership in centralized air conditioning control. This experience is available to you at no obligation. A Honeywell specialist will be glad to work with you and your ideas from the original planning stage of any building. Just call your local Honeywell office for full details.

**List of installations, including those in your area, available on request.*

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available ground space on the site. This will release most of the area for the development of plazas and malls, reflecting pools, fountains and sculpture, and enclosed glass-walled walkways.

The railroad property is a low-elevation site, surrounded by filled-in ground. It will be covered with multilevel plazas which in effect will provide a roof for the whole area. This will allow for three levels of parking. Escalators will provide access to the various buildings from the parking areas.

The main line tracks of the Boston and Albany Railroad will run underground diagonally across the whole site. A contract has been made with the Massachusetts Turnpike Authority to permit the construction, if and when authorized, of an eight-lane underground superhighway, roughly parallel to the Boston and Albany tracks.

Hoyle, Doran & Berry, of Boston, are the architects for the project; Metcalf & Eddy, also of Boston, have been retained as engineers; and Pereira & Luckman, of Los Angeles, are the coordinating architects.

Rader Makes Deer Island Study

Rader and Associates, Engineers and Architects, of Miami, Fla., recently completed a preliminary report of the proposed Deer Island, Miss. development for the Biloxi Bridge and Park Commission. The report was prepared as a basic guide for the commission to develop this island into a self-contained community.

Deer Island lies about 1000 feet off the Gulf Coast of Biloxi and is nearly 10 feet above sea level. It is proposed to dredge the surrounding tidelands and increase the size of the island to 3300 acres, part to be sold for private residences and the rest used for streets, utility sites, municipal and civic centers, and recreational facilities.

The dredging and fill of the area adjacent to the island will improve waterways for navigational and recreational purposes.

The preliminary master plan prepared by the Rader firm divides the island down the middle with an attractive inland waterway, converting most of the lots into desirable waterfront locations. Deer Island will be a self-contained, zoned urban area with emphasis on middle-income, single-family residential units. The recreational facilities of Deer Island will be made available to the general public. Besides acres of public beach, Deer Island will also contain public docks, amusement parks, picnic areas, tennis courts, marinas, a zoo, a golf course, and fishing facilities.

The island with its 24.7 miles of protected canals, will provide excellent boat anchorages during times of severe storms, and the causeway will create a protected harbor for water skiing and small boat regattas.

Deer Island will be connected to the mainland by a toll causeway and bridge. The development will be

The Honeywell Fire Detection and Alarm System ideally adapted to automatic fire reporting both within the building and to the nearest fire station, provides these unique features: (1) Positively locates fire by light—not necessary to count bell strokes to identify zone, (2) Dependable—transmits alarm even with ground or break in circuit.

financed by revenue bonds to be retired by the proceeds from the sale of the land and income from concessions, tolls, and utilities. Short-term serial bonds will be secured only with the income derived from the sale of the land.

NSPE Urges Space Commission

Creation of a Federal Space Exploration Comission with full power and resources to undertake long-range space programs has been urged by the National Society of Professional Engineers.

In a policy statement approved by the group's board of directors at its spring meeting in Lansing, Mich., the Society proposed that "the Administration present to the Congress a program for the national direction of space exploration encompassing as full and comprehensive a legislative structure as that embodied in the Atomic Energy Act."

"It is of the utmost importance," the statement continued, "that the leadership of the Federal government in the exploration of space not be confined to patchwork or piecemeal attempts merely to coordinate the research and development now being carried on by independent military and other groups."

Warning of the "ominous import of the implications in recent Soviet achievements which suggest that the USSR may be widening the gap in heavy rocket engines and specific plans for lunar and planetary exploration," the NSPE statement emphasized that our space programs must be backed by the "full organization and resources of the United States of America."

The NSPE board of directors pointed out that this country "has as great a reservoir of scientific and engineering knowledge and skill as can be found in any nation on earth, but it is clear that America has not accorded the highest priority to the development of projects specifically directed to the furtherance of space rocketry and space exploration."

The NSPE statement proposed that Federal Space Exploration Commissioners be appointed by the President, and that space projects be given highest level legal and organizational status.

After adoption by the NSPE board, the statement was sent to President Eisenhower by Garvin H. Dyer, president of the 43,000-member organization.

International Technical Assembly in Israel

The World Assembly of Engineers and Architects, Friends of Israel, will be held from May 29 to June 9, 1958, in conjunction with the celebration of the tenth anniversary of the establishment of Israel.

The Assembly is sponsored by the Association of Engineers and Architects of Israel and is endorsed by the Technion-Israel Institute of Technology, Israel's only engineering university.

Engineers and architects from all parts of the world

For your electrical systems—Honeywell Fire Detection and Alarm System

Automatic equipment, adaptable to any installation, backed by the support that only Honeywell offers!

Now a new automatic fire detection and alarm system from one reliable source—Honeywell. It offers these unique features—

- Positively locates fire by numbered lights—not necessary to count bell strokes to identify zone.
- More dependable—transmits alarm even with a ground or break in detection circuit.
- Stand-by battery provides protection even when power fails.
- Ideally adapted to automatic reporting of fires both to building supervisor's office and to nearest fire station.

In addition Honeywell assists you in planning this new system; gives you complete system inspection and checkout after installation. And from then on your clients get fast local service and maintenance from Honeywell's service organization in 112 sales offices across the country.

The automatic detector is pleasingly styled with an ivory base to blend with most ceiling finishes. It is easy to install, fits a standard 3" outlet box or plaster ring. And it has two sets of contacts which give it extra dependability.

Manual Fire Alarm Station with mercury switch gives long, dependable life. Heavy-duty construction withstands shock and vibration. False alarm caused by accidental impact almost impossible because switch must be pulled down rather than pushed in.

Honeywell

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are expected to participate in the sessions and seminars comprising the Assembly. The central theme of the Assembly will be devoted to the "Role of Technology in the Development of Israel."

Prime Minister David Ben-Gurion will address the opening session of the Assembly, which will be held at the new campus of the Technion-Israel Institute of Technology, in Haifa, following the dedication of the Albert Einstein Physics Institute and the Winston Churchill Auditorium.

Subsequent sessions will be held in Tel Aviv and Jerusalem, and Assembly delegates will tour Israel and inspect the engineering and architectural developments of the past decade.

Engineers and architects interested in attending the Assembly are urged to write to the American Society for Technion-Israel Institute of Technology, 1000 Fifth Ave., New York 28, N. Y.

Airline Inaugurates Air-Ground Phone

Passenger response to an air-ground public telephone that Northwest Orient Airlines recently installed in one of its Stratocruisers has been so enthusiastic that NWA will install a unit in another Stratocruiser.

Northwest made its first air-ground telephone installation about 3 months ago. It is the first airline to install a public telephone in a plane used in regularly scheduled passenger service. Passengers may make calls to and receive calls from any point in the nation, as long as the plane is within a 175-mile radius of special ground sending and receiving stations at Chicago and Detroit.

The sending and receiving stations are operated and maintained by the Illinois and Michigan Bell Telephone companies.

Carolinas Reactor Site Unique

The proposed Carolinas Virginia nuclear power plant will be located between a hydroelectric plant and a conventional steam plant.

This proximity to two other types of power generating plants – believed to be the first instance of this kind in the world – shows the nuclear plant in sharp contrast with the conventional facilities. The Carolinas Virginia program is designed to establish its worth as a future source of electric power.

Plans for the South's first nuclear power plant call for a new type of reactor design which is expected to contribute to substantial advancement in the art of nuclear power generation. It will consist of a pressure tube type reactor, cooled and moderated by heavy-water, and using slightly enriched uranium as fuel. Completion is scheduled for 1962.

Located at Parr Shoals on the Broad River about 25 miles northwest of Columbia, South Carolina, the nuclear plant is being sponsored by Carolina Power

In a restaurant application, the Honeywell "Renew-Air" Filter has high absorption capacity for such objectionable odors as tobacco smoke, burning fat, fish and others likely to be present. In the past, increased outdoor air intake was necessary to diffuse these odors, which resulted in higher air conditioning costs. Now Honeywell's "Renew-Air" Filter removes the odors, enables air conditioning to be operated economically with reduced air intake.

Carolinas Virginia Nuclear Power Plant.

& Light Co., Duke Power Co., South Carolina Electric & Gas Co., and Virginia Electric & Power Co., which are members of the Carolinas Virginia Nuclear Power Associates, Inc.

Stone & Webster Engineering Corporation, currently working on designs for the Yankee Atomic Power Plant, is the architect-engineer firm for the Carolinas project. Westinghouse Electric Corporation will provide the reactor; General Nuclear Engineering Corp. is the nuclear consultant.

Code of Ethics for Surveyors

The Association of Professional Photogrammetrists has developed a Code of Ethics to guide its members engaged in highway mapping work.

The popularity of aerial engineering for bridge and highway location recently has brought many new firms into this field. Twenty-two companies have subscribed to the association's Code of Ethics, according to Col. John Ladd (U.S.A. Ret.), executive secretary of the association.

Highway departments and consulting engineers may obtain copies of the code and a list of member firms by writing to association headquarters at the following address: Association of Professional Photogrammetrists, 224 Dupont Circle Bldg., Wash. 6, D. C.

Los Angeles Harbor Toll Span Proposed

An enabling bill to provide for the financing and construction of a $24-million toll bridge across Los Angeles Harbor between San Pedro and Terminal Island was passed by the California Assembly and sent to the state Senate.

Under the measure, the state would contribute $5 million, Los Angeles city and county would put up $2 million each, and $15 million would be provided by revenue bonds.

The Los Angeles City Council approved a proposal that the legislative bill be changed to permit the city to pay its share in installments of $200,000 a year for 10 years, instead of in a single payment. Of this amount half would be paid by the City Harbor Department, and the rest would come from the city's

For your mechanical systems . . .
Honeywell's "Renew-Air" Filters

reduce size of cooling equipment needed, pay for themselves before installation

In restaurants, stores, hotels, office buildings, Honeywell "Renew-Air" Filters can save your clients money. By reducing the amount of outdoor air intake normally required to diffuse internal odors, "Renew-Air" Filters enable you to specify smaller cooling equipment, give your clients efficient air conditioning at a lower initial cost. Savings more than pay for the cost of the Honeywell "Renew-Air" Filters themselves. In addition, client's operating costs are lowered.

And, combined with the Honeywell Electronic Air Cleaner, "Renew-Air" Filters are even more efficient. Their activated charcoal lasts and lasts because no oily smoke or film gets through to clog up the charcoal's pores. There's a bonus with the Honeywell Electronic Air Cleaner, too. It reduces cleaning and decorating costs for owners because it removes dirt particles in the air six times more effectively than ordinary filters.

"Renew-Air" Filters are available in four different sizes and types of cells, easily removable from the frame for re-activation. The Honeywell Electronic Air Cleaner is sold in "building block" modules adaptable to any installation. Call your local Honeywell office for more details.

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allocation of gasoline tax funds. The money would be repaid from tolls on the bridge which would replace a ferry service.

Consultant Association Invites Correspondence

To further world-wide exchange of technological information, the Association of Consulting Chemists & Chemical Engineers, Inc., New York, invites correspondence from foreign consulting chemists and chemical engineers regarding technological problems.

The Association will direct such correspondence to the proper channels and has stated that reciprocal actions may be expected from Association members.

All letters should be in English, and on letterheads, and should be addressed to the Association of Consulting Chemists and Chemical Engineers, Inc., attention of Miss A. B. Bowers, Director of Publicity, 50 East 41st St., Room 82, New York 17, N. Y.

CEC is Growing

The second annual meeting of the Consulting Engineers Council is scheduled for May 1, 2, and 3, in San Francisco. Ten delegates representing 494 members first met in 1956, in Tulsa, Okla. Nineteen delegates representing more than 1000 members will be present this year.

Principal items of business will include election of officers, acceptance of a new set of by-laws, and establishment of the 1958-59 budget. Affiliation of at least one new member association is expected. Reports are anticipated from a number of committees, including: Corporate Practice, Fees and Contracts, CEC-Producers Council, and Office Practice.

Subjects for consideration on a national level include: liaison in Washington, the wage-hour law, registration of consulting engineers, free engineering.

The meeting will be held at the Sir Francis Drake Hotel in San Francisco. The Consulting Engineers Association of California will act as host.

Highway Bill Goes to White House

Congress took final action on the "Federal-Aid Highway Act of 1958" early in April and sent it to the White House.

The bill, containing adjustments agreed to by Senate and House conferees, provides a sharp acceleration of the National Highway Program. It represents a combination of legislation sponsored by Chairman George H. Fallon (D-Md.) and Chairman Albert Gore (D-Tenn.) of the House and Senate Roads Subcommittees, respectively.

Fund authorizations are boosted for interstate expressways, ABC highways, and public domain roads. In addition, it sets up a one-year emergency ABC program aimed to stimulate the general economy.

An important section of the bill suspends the "pay-

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For your mechanical systems...Honeywell Hi Velocity Double-Duct Mixing Box Controls

Now your choice of two constant volume systems

1. Honeywell's Volumatic* system gives clients dependable, economical, constant volume control of double-duct systems. This control system uses piston motors with nylon bearings which require less lubrication and a sensitive pressure regulator. It can be applied to all sizes and types of mixing boxes.

2. Honeywell's Duablend* system gives your clients superior performance and minimum maintenance. Better performance is secured by using *two* pressure regulators to assure constant volume from *each* duct (under control of space thermostat) regardless of pressure changes. Its exclusive Sub-master pressure regulator provides a similar stabilizing control action to the Sub-master duct thermostat in heating and ventilating units.

For minimum maintenance, the Duablend† system uses the simple Honeywell Air-Balance Valves*. These valves have no mechanical parts to wear and no adjustments. The valves operate on the balance of air pressure on two sides of a flexible diaphragm.

*Trademark

†Duablend formerly termed Air Blender

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as-you-go" provision (Byrd Amendment) of the Federal-Aid Highway Act of 1956 for fiscal years 1959 and 1960. Since Highway Trust Fund revenues for these years will be insufficient to support anticipated expenditures under the proposed increased authorizations and apportionments, money will be appropriated to the Trust Fund from the General Fund of the Treasury, as repayable advances.

Naval Air Test Facility

The U.S. Navy is completing its $23.5-million Naval Air Test Facility, at Lakehurst, New Jersey, to develop launching and recovery systems for its heavier, faster carrier based planes.

One of the major problems to be studied will be the development of a catapult system for nuclear carriers independent of a high pressure steam supply. Also to be studied at this 4500-acre site will be new methods for jet aircraft recovery aboard carriers.

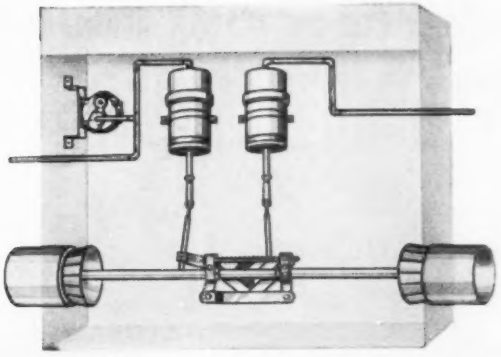
Two separate installations are under construction, designed in conjunction with the Navy's Bureau of Yards & Docks by Louis Berger Associates, consulting engineers, of Orange, New Jersey.

The primary installation consists of two catapults — one steam, the other gas-air. The steam model, supplied with steam from an adjoining steam plant, is elevated six feet above the end of an 8000-ft runway. A movable ramp connects the steam catapult to the runway. The gas-air catapult is flush with the runway and incorporates a braking device extending 400 feet from the firing line.

Halfway down the runway is an installation which will be used to test and evaluate aircraft arresting gear systems on incoming planes, including rapid succession landings at 20-second intervals.

Navy Test Catapults Under Construction.

Near the catapults is a network of five parallel concrete test tracks for hurling deadweight devices against



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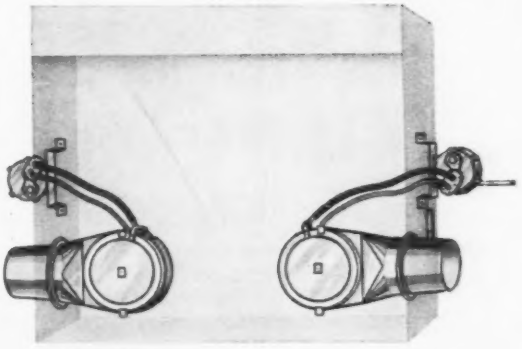

DUABLEND

Here's how these two dependable systems work

Volumatic System: 1) Space thermostat operates motor to change ratio of hot and cold air. 2) Pressure regulator in mixed air operates another motor to adjust linkage, increase or decrease total volume from both hot and cold ducts (as shown above). Or, (not shown) 1) Space thermostat operates motor to control hot duct valve. 2) Pressure regulator in mixed air operates motor to control cold duct valve, maintain constant total volume. This low cost system gives dependable control, is easy to maintain, fits all sizes and types of mixing boxes.

Duablend System: 1) Space thermostat resets Sub-master pressure regulator controlling valve in hot duct. 2) Pressure regulator in mixed air controls the total air volume by operating cold duct valve. 3) Change in flow resulting from changes in hot duct pressure is corrected by Sub-master regulator operating hot valve without disturbing cold. 4) A change in flow caused by changes in cold duct pressure is corrected by regulator controlling total flow which adjusts cold duct valve. Sub-master flow regulator holds hot duct flow constant.

arresting gear. On the first strip, already in operation, a rubber-tired car powered by four jet engines accelerates a weighted cart down a 5800-ft track at speeds to 175 mph. The jet car is stopped automatically, but the cart, loaded with 50,000 pounds of weights, is caught by the arresting gear. The remaining tracks will be 7300-ft long, and will be capable of test operations to 230 mph.

Belgian World's Fair

The Argonne National Laboratory has been selected to display atomic age "tools" at the World's Fair which opened in Brussels, Belgium, on April 17.

Elmer W. Rylander, executive assistant for education at Argonne, said that the exhibits from Argonne would consist of:

¶ New electronically controlled master-slave servo-manipulators—"mechanical hands" that enable a human operator to perform work in a radioactive area.

¶ A working model of a continuous countercurrent liquid-liquid extraction system, involving the separation of uranium and copper.

¶ A 100-channel pulse-height analyzer, mainly used to determine the number of gamma rays emitted from a radioactive source and their energy.

Rylander pointed out that Argonne will have displays in both the International Science Section of the Fair and the United States exhibit at Brussels.

The International Science Section will have displays in four classes – the atom, dealing with atomic physics; the molecule, dealing with chemistry; the crystal, dealing with solid-state physics; and the living cell, dealing with biology.

The liquid-liquid extraction model will be located in the International Science Section of the Fair, together with exhibits of 15 other nations. The electronic manipulators will be set up in the United States Pavilion at Brussels.

The United States Pavilion will be a large, two-story circular building with amber-tinted steel columns and honeycomb plastic walls, set on a landscaped triangular site of six and one-half acres.

Electronic Surveying

A time- and cost-saving new surveying technique just devised now is being applied for the first time on highway work.

Turning to modern electronic theories and new radar-type instruments, highway engineers have applied a system of measuring that is quick and accurate. They are utilizing this revolutionary method to establish the numerous ground control points needed to construct the 41,000-mile Interstate System.

The system, called "tellurometer" from the Greek words that mean "earth" and "measurement," incorporates a microwave transmitter at one station and

For your mechanical systems . . .

Now, a Honeywell Pneumatic Round Thermostat for every installation, every function!

Now Honeywell offers models of the famous Pneumatic Round Thermostat for every application—summer-winter, day-night, modulating, two-position, and submaster.

All versions provide the accuracy, fast-response and dependability of the Honeywell Pneumatic Round, the only new pneumatic thermostat in the industry. And all models feature the world's most popular round thermostat styling.

Simplified design and a complete line of installation fittings make these thermostats easy to install and maintain. Pleasingly styled, tamper-proof guards are available where needed.

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a receiver at the other station. The time it takes the waves to reach the receiver and return is read at the transmitter in micro-milliseconds. This reading, in turn, is translated into miles, feet, and inches.

The maximum possible error is only 11 inches in 40 miles. However, there is an inherent error of plus-or-minus 2 inches in the system, so use of the tellurometer is restricted to distances over 500 feet. Another major advantage is that the operators do not have to be able to see each other.

In addition, engineers have found that their electronic instruments can be used in any kind of weather. Fog, rain, or snow, or even darkness do not hamper their operation or affect the accuracy of the readings.

Both the transmitter and receiver are small, compact units, easily portable through rough terrain by a two-man team.

One man packs the transmitter to a base line station being used as the starting point for a traverse line and assembles the device on a tripod. His teammate, meanwhile, sets up the receiver at the "unknown" point previously set by the reconnaissance crew. By swinging his instrument around the horizon and watching the strength of the radar waves on an oscilloscope, the transmitter operator can quickly locate the receiver.

Engineers are using the system in Virginia to establish ground control points every two or three miles along 1000 miles of proposed interstate highways. Here, the electronic technique is expected to cut the cost of the operation from $750,000 to $40,000.

John F. Meisner, Chicago consulting engineer for the Illinois State Highway Department, used the system recently to establish points through a 12-mile stretch of rough terrain for a by-pass around Peoria, Illinois. Although this was their first use of the tellurometer, a small crew ran a traverse involving some 30 legs in two weeks. Traditional methods would have taken two to three times as long.

Skyscraper Uses Vibration Pads

Lead-asbestos pads beneath the 115 steel columns that will support the new 54-story skyscraper headquarters of Union Carbide Corporation will cushion the building against vibration from railroad traffic running in and out of New York's Grand Central Station. The building rises directly from the network of tracks linked to the station.

The foot of each column and associated substructures are set in a concrete protective pier. Lead-asbestos anti-vibration pads line the floor of the pier. The column itself rests on a grillage of "I" beams laid over the pads. Shoulders of the grillage, around the column base, are covered with additional lead pads, which, in turn, are covered to a depth of six inches with reinforced concrete. The concrete supports bal-

At Bayonne Hospital . . .

50 YEAR TEST PROVES FOSTER DEPENDABILITY

Hospitals can't afford to have equipment breakdowns. New Jersey's Bayonne Hospital is no exception.

Foster valves, recently replaced, had been in service for fifty years; others, still operating satisfactorily, for thirty and more.

When you need reliability in valves, specify Foster.

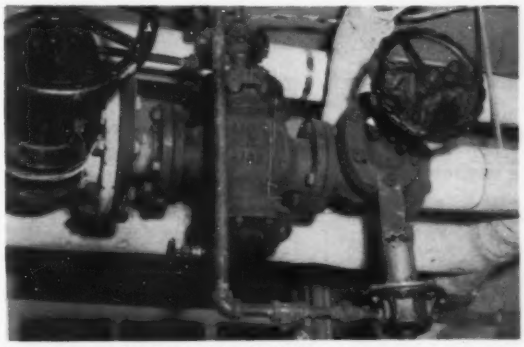
FOSTER ENGINEERING COMPANY

835 Lehigh Avenue • Union, New Jersey

AUTOMATIC VALVES • SAFETY VALVES • FLOW TUBES • CONTROL VALVES

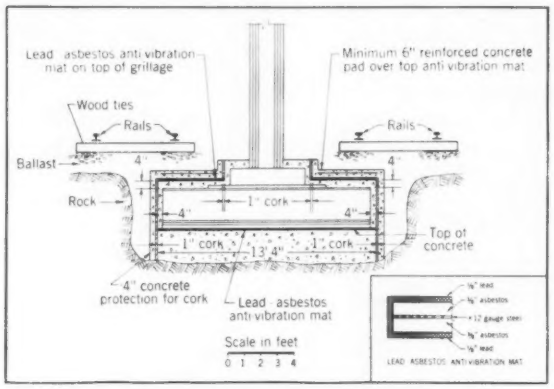
Foster 4-inch Q Valve, installed in 1920

Foster 5-inch "G" Pressure Reducing Valve, installed in 1928



Foster Remote Pilot Operated 50-G2V Valve in vacuum-pressure service, controlling reduced steam pressure feeding zone control heating system.

last and railroad tracks, which pass directly over the pier on either side. Interior sides of the pier are lined with cork.



Details of Anti-Vibration Column Footings.

The pads are sandwich structures, the core of which is 12-gauge steel. The core is encased on either side by ⅜-in. layers of asbestos, outside of which are ⅛-in. layers of sheet lead. The assembly is clamped together under 200-psi pressure while the edges are sealed with lead.

Principle of the pads is resistance offered to shock waves as they pass from one substance to another. Lead was chosen for the shell because of its vibration damping properties and its resistance to corrosion.

This principle also was used to insulate the Waldorf Astoria Hotel from the same rail traffic and, more recently, to shield Montreal's Queen Elizabeth Hotel against vibration of trains. Canadian National Railways' Montreal station and the 30th Street Station of Pennsylvania Railroad in Philadelphia have made similar use of lead insulation pads.

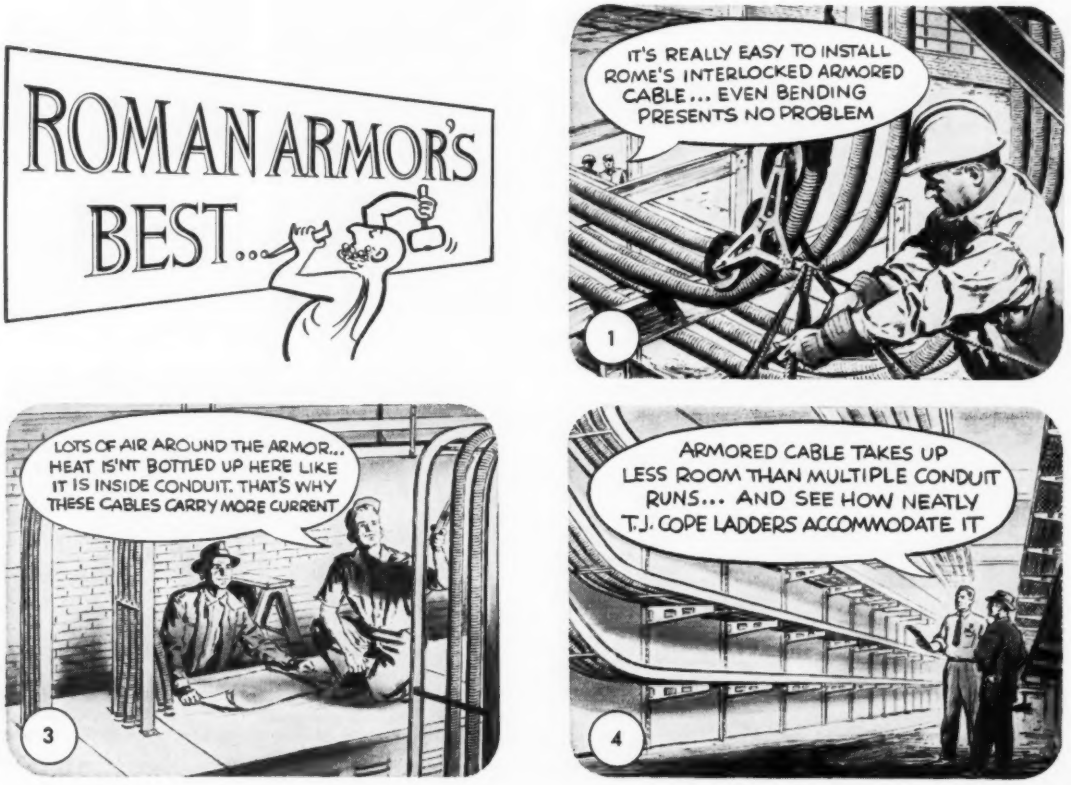
The consulting engineers working on the new Union Carbide Building are Syska & Hennessy, Inc., of New York, mechanical, and Weiskopf & Pickwork, also of New York, structural.

Consultants to Operate Geneva Atom Exhibit

The United States nuclear reactor safety exhibit at the Second International Conference on Peaceful Uses of Atomic Energy at Geneva, Switzerland, September 1 through 13, will be designed and operated by Holmes & Narver, Inc., Los Angeles consultants. The firm was selected for the work by the U. S. Atomic Energy Commission.

The announcement came from Kelly McBean, manager of the engineering company's Nuclear division.

As in the first "Atoms-for-Peace" conference, held in 1955, scientists from iron curtain countries as well as the free world will exchange ideas and techniques


ROMAN ARMOR'S BEST...
IT'S REALLY EASY TO INSTALL ROME'S INTERLOCKED ARMORED CABLE... EVEN BENDING PRESENTS NO PROBLEM
1
LOTS OF AIR AROUND THE ARMOR... HEAT IS'NT BOTTLED UP HERE LIKE IT IS INSIDE CONDUIT. THAT'S WHY THESE CABLES CARRY MORE CURRENT
3
ARMORED CABLE TAKES UP LESS ROOM THAN MULTIPLE CONDUIT RUNS... AND SEE HOW NEATLY T.J. COPE LADDERS ACCOMMODATE IT
4

for constructive and peaceful uses of the atom. Military applications are not on the conference agenda.

As presently conceived, the U. S. exhibit will feature as its central point of interest a working model of the SPERT-1 reactor developed at the National Testing Station, Arco, Idaho. The SPERT (Special Power Excursion Reactor Tests) reactor was designed to study effects of sudden changes in reactor reactivity. Explanation of the exhibit will be carried in four languages – English, French, Spanish, and Russian – by special tape recordings during the demonstration.

Phoenix Power Plant

Ebasco Services, Inc., New York engineering and construction firm, has begun construction of Arizona Public Service Company's new Ocotillo steam electric station, near Phoenix, Arizona.

Of outdoor design, the new plant, which also is being engineered by Ebasco, will consist of two units with a generating capacity of 110,000 kw each.

Good Design Practices

Syska & Hennessy, New York consulting engineers, has compiled a list of design precepts for the industrial plant consultant who is anxious to lower maintenance and operating costs. This list includes:

¶ Locate frequently operated valves for ease of access and operation.

¶ Provide for orifices in main steam lines, condenser mains, and chilled water mains at time of installation. Later orifice plates can be installed after proper capacities have been determined through operation.

¶ Do not stint on the number and size of access doors. Size them generously for adequate future maintenance and cleaning of filters, coils, and bearings. Call for access doors in fan scroll casings to insure proper cleaning of fan interiors; also in duct work to permit periodic cleaning of interiors.

¶ Interconnect as much equipment as possible where economically practical to provide maximum flexibility for possible contingencies.

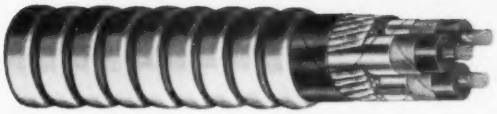
Silicon Process Plant

Burns and Roe, Inc., New York consulting firm, has been engaged by W. R. Grace & Co., to design the installation of a new process to manufacture ultra-high-purity elemental silicon. The work is being handled in the company's Baltimore office.

The plant will be located in Puerto Rico, and will utilize a standard building being erected by the Puerto Rico Industrial Development Company.

Burns and Roe has based its design on a process already proven by Pechiney, the French chemical and metallurgical concern.

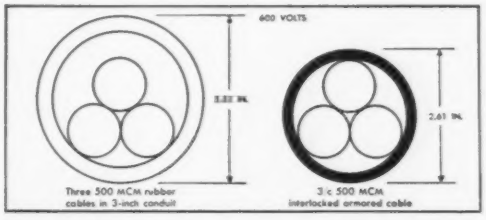
The plant is scheduled to be completed and in production later this year. ▲▲



For 600- to 15,000-volt service Rome's interlocked armored cable is available in three-conductor construction with Rozone A (butyl) insulation. It offers many more benefits than described here. For complete information, contact your nearest Rome Cable representative and ask for your free copy of Bulletin RCP-730. Or mail the coupon today.

ROME CABLE
CORPORATION

A matter of FACT



Reduced space requirements Less space is needed for Rome Cable's interlocked armored cable –almost one inch less width for each three-conductor 500 MCM interlocked cable than for cable-in-conduit type installations.

FREE BULLETIN describes all the benefits of Rome's Interlocked Armored Cable.

ROME CABLE CORPORATION
Department 730, Rome, New York

Please send me a copy of the new Rome Cable Bulletin RCP-730.

Name .....

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Coal scores

with Notre Dame

University power plant burns coal for modern steam generation

Enrollment growth and building expansion had put a strain on the power plant at the University of Notre Dame, South Bend, Ind. After careful study—by the consulting firm of Albert Kahn Associated Architects and Engineers, of Detroit—a decision was made to modernize steam facilities and add power generating equipment. Two new coal-fired boilers, a turbo-generator and auxiliary equipment were installed.

Maximum efficiency is achieved through automatic combustion control and complete instrumentation. Today steam is generated *economically.* Another noteworthy result of these innovations has been the *cleanliness* of operation . . . making Notre Dame's power plant a model of good housekeeping.

Facts you should know about coal

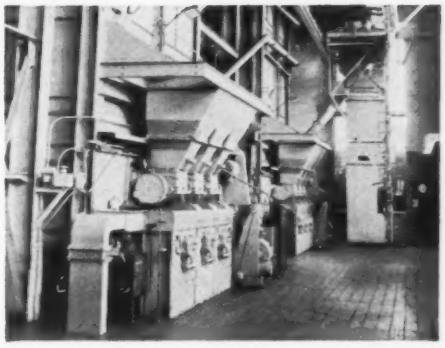
You'll find that bituminous coal is not only the lowest-cost fuel in most industrial areas but up-to-date coal burning equipment can give you 15% to 50% more steam per dollar. Today's automatic equipment can pare labor costs and eliminate smoke problems. And vast coal reserves plus mechanized production methods mean a constantly plentiful supply of coal at stable prices.

Technical advisory service

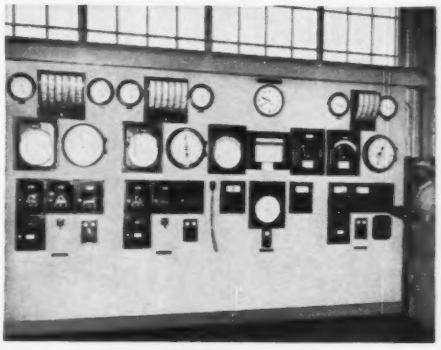
All companies planning a new power plant, or the remodeling of a present one, should consult an engineering firm on its design and construction as the University of Notre Dame consulted Albert Kahn Associated Architects and Engineers. As a matter of fact, every Bituminous Coal Institute advertisement advises its readers to take this step. When you have such a project, our Engineering Staff will be glad to assist you in your fuel cost survey with any coal information you may require.

Meanwhile, we believe you will be interested in our informative case history booklet, complete with data sheets. Send coupon at right for your copy.

BITUMINOUS COAL INSTITUTE
Department CE-05
Southern Building • Washington 5, D. C.



Firing aisle shows both Union Iron Works boilers . . . identical 2-drum, bent-tube type with a normal rating of 70,000 lb/hr. These units are fired by Detroit Rotograte Spreader Stokers.



All combustion controls and instruments are centered in this control panel by Hays Corp.

Furnace ash and dust from Prat-Daniel Collectors are conveyed pneumatically to this 50-ton ash storage silo. Rotary dustless unloader assures clean removal of material. Ash-handling system is by United Conveyor Corp.

SEND COUPON FOR YOUR COPY OF "Guide Specifications for Typical Low-Pressure Commercial Heating Plant." This booklet, adaptable for design loads 3,000 to 24,000 EDR steam, contains specifications, drawings and tables on all aspects of a typical heating plant. CE-05

☐ Guide Specifications Booklet ☐ Case histories on larger plants

Name_____

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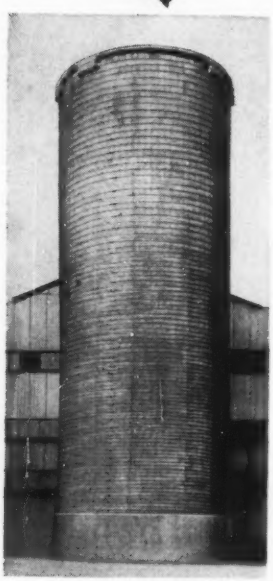
Company_____

Address_____

City_____ Zone____ State____

It's what's INSIDE that counts!



1
2
3

Most storage bins look good on the outside, BUT...

1. Have they been built to meet the required method of loading?
2. Is the storage area and inside wall built to favor the characteristics of the material to be stored?
3. Will the flow of the material meet the required volume and rate of flow at the point of discharge?

We at Neff and Fry make it a point to see that all three requirements are in balance.

NEFF & FRY COMPANY
302 Elm St., Camden, Ohio

N&F It's the STAVE that makes the difference

Men in Engineering

Richard D. Fine, a consulting engineer, has been named a life member of the New York Association of Consulting Engineers.

R. Franklin Parker has been appointed executive vice president, general manager, and director of Petrol-Structors Ltd., Consulting Engineers, with offices in Calgary, Alberta, Canada. Parker formerly was associated with the U.S. firms of O. L. Olsen Co., of Houston, and Bechtel Corp., of San Francisco.

PARKER

GRADY

Burns and Roe, Inc., the New York engineering and construction firm, has announced two appointments. William J. Grady has been named manager of construction, after returning to the firm's headquarters in New York City following completion of his assignment as project manager for the Shippingport atomic power station, in Shippingport, Pa. William G. Carlson has been appointed project engineer to supervise an assignment for the U.S. Atomic Energy Commission Hanford Operations Office.

Raymond D. Maxson, former senior vice president of Commonwealth Edison Company, has joined Sargent & Lundy, Chicago engineering firm, as consultant. He will specialize in utility management and nuclear power development.

Pat Rowley, former advertising agency account executive, has joined the Sales and Public Relations Consulting Department of Ebasco Services Incorporated.

Jack L. Staunton, consulting civil and hydraulic engineer, has opened his own office at 60 West 46th St., New York. He was formerly associated with Seelye, Stevenson, Value & Knecht.

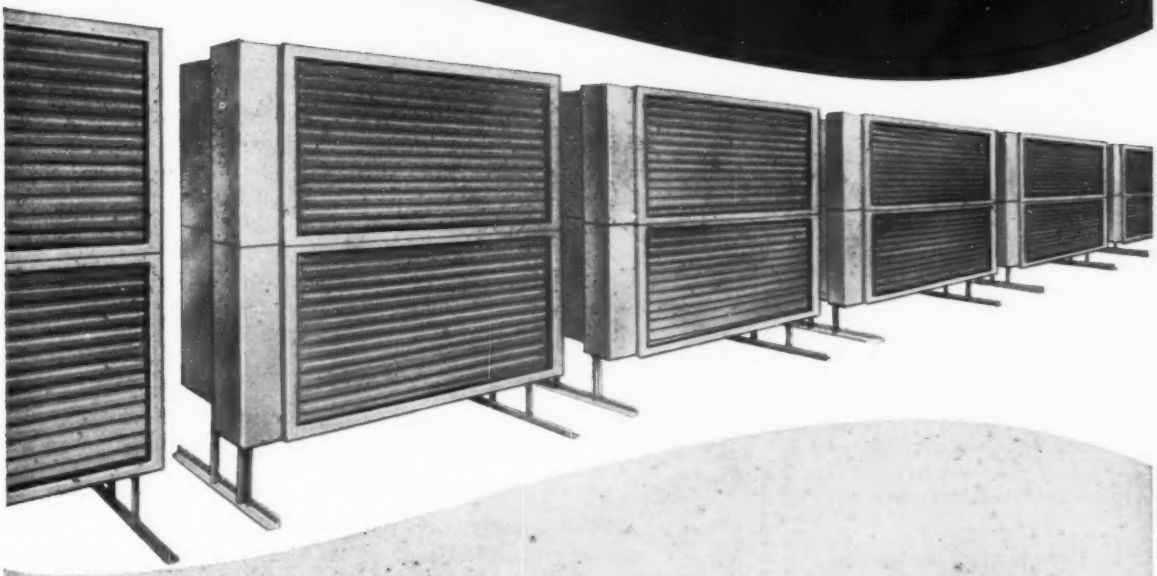
J. T. Williams, consulting mechanical and electrical engineer, has established his own office at 534 Merino Building, 239 Pretorius St., Pretoria, Transvaal, Union of South Africa. His mailing address is P. O. Box 1617, Pretoria.

Ford, Bacon & Davis, New York engineering firm, has retained Robert D. Eckhouse & Associates, New York, as public relations counsel. Ford, Bacon & Davis specializes in design, construction, management, industrial engineering, reports, and valuations.

Frank W. Chappell, Dallas consulting engineer, was made an honorary member of Chi Epsilon, South-

KRAMER

UNICON for UNLIMITED TONNAGE



Kramer Unicon has brought a new era into the industry. With more than 20 years of unique practical experience and know-how in dry condensing, Kramer again offers new avenues of opportunity to the air conditioning and refrigeration industry.

Unicon now has no capacity limit. Standard Unicon systems up to 540 tons are now cataloged for the first time.

Unicons for heat pump applications are now also available with no horsepower limitations.

Kramer engineering and design has proven that the Unicon can move large volumes of air with extreme quietness.

Unicon has long proven by actual experience that it is free from fouling or corrosion and requires practically no maintenance.

The total operating weight per ton for Unicon is very low, resulting in minimum platform and reinforcement requirements.

Unicon space requirements are surprisingly small; a 300 ton system requires only 15′ x 14′ floor space and is 12′ high.

WRITE FOR BULLETIN U-391

KRAMER TRENTON CO. • Trenton 5, N.J.

44 YEARS OF CONTINUOUS ACHIEVEMENT IN HEAT TRANSFER

A Message to Executives
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**100% financing
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Complete financing on lease-purchase plan—low interest rate—deferred amortization. Plant "shells" now being readied for completion. Inspection welcomed.

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No capital stock and franchise taxes—no machinery and equipment taxes—no stock transfer tax—no state personal income tax—reduced manufacturer's sales tax.

Plant location services

Staff specialists available to serve industry, engineering firms, management consultants, industrial realtors and others with fully detailed plant location data.

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1143 State Street, Harrisburg, Pa.
Phone: CEdar 4-2912

ern Methodist university chapter, for his part in establishing National Engineers' Week.

Nat T. Kanarek, former chief structural engineer with Brown & Blauvelt, New York consulting engineers, has organized his own firm at 276 West 43rd St., New York. The firm will specialize in structural and civil engineering.

R. H. Tatlow 3rd, president of Abbott Merkt & Co., is chairman of the Engineers Joint Council national engineers committee. The committee is a liaison group between the Council and the Federal government.

The Association of Consulting Engineers of Canada elected J. G. Frost of Montreal president at the annual general meeting. Other officers named are C. C. Parker, Hamilton, Ontario, vice president; R. R. Duquette, Montreal, honorary secretary and treasurer.

Johannessen and Girand, Phoenix consulting engineers, have moved their offices to 3500 North Central Avenue.

Albert A. Erkel & Associates, Los Angeles consulting structural engineer firm, has opened new offices at 3515 Cahuenga Boulevard. The firm is doing engineering work on a number of major projects in Los Angeles and Orange Counties.

Arthur D. Little, Inc., Cambridge, Mass. industrial research consulting company, has elected Clarke Simonds and Joseph J. Snyder directors of the firm.

T. E. Flowers, Jr. and R. F. Hay, specialists in community and industrial planning, recently joined the staff of the space planning department of Ebasco Services Inc.

Lambert L. Lind, Jr., electrical engineer in Ebasco's design and construction division, has been appointed special assistant to Roy W. Johnson, director of the Advance Research Projects Agency in the Department of Defense. The agency recently was established to meet the needs of the country's space conquest program.

BURCHER SANDERS

Irvin C. Sanders recently joined the engineering staff of Miner and Miner, Inc., as manager of the new industrial facilities department, Littleton, Colo.

Harry E. Burcher is now with the firm's general engineering department, following his retirement from the army.

Miss Sue Ammerman has been elected secretary of Chempro, Inc., Pittsburgh consulting firm.

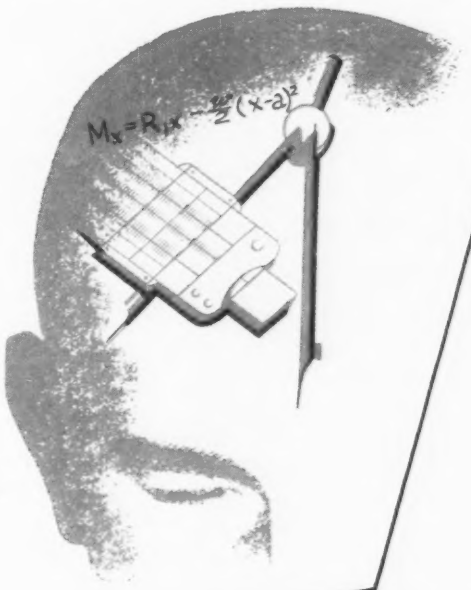
Herbert G. Keating, Jr., and Edward H. Morgan have joined A. M. Kinney, Inc., consulting engineers of Cincinnati and New York, as project engineers in the mechanical department.

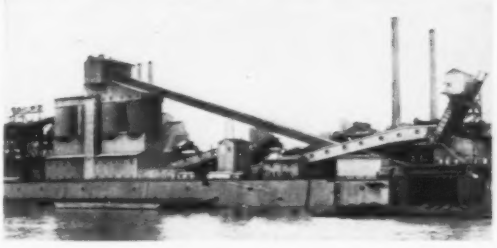
Benjamin Gray has been appointed chief architect for Burns and Roe, Inc., New York consulting engineering firm. Gray will head the company's architectural department, and will continue as a director and officer of Burns and Roe's wholly owned subsidiary, Franklin Engineering Corp.

Bennett and Straight, Inc., an architect-engineer firm in Dearborn, Michigan has named Lester H. Davies and Donald T. Mason to the firm's board of directors. W. W. Sanders has been appointed general manager; E. N. Becker,

CREATIVE ENGINEERING

...plus the technical abilities of ROBERTS & SCHAEFER can give your clients a greater return from their investment in material handling facilities.





2000 TONS OF COAL PER HOUR
from barges—to blending bins—to coke ovens

You can be sure of greater economy and more efficient performance of your clients' material handling plants when you call on the engineering skills of Roberts & Schaefer.

The unusual and the difficult are always a challenge to R&S engineers when they build material handling facilities to meet your most critical specifications for performance, flexibility and economy.

The experience and technical abilities of the Roberts & Schaefer organization are readily available to consulting engineers who are working on material handling projects.

R&S material handling plants, simple or elaborate, are built with processing, distributing and storage systems, complete with crusher, screens, conveyors, scales, car dumps, skip hoists, preparation and drying equipment—and with the capacity to give your clients the maximum return on their investment.

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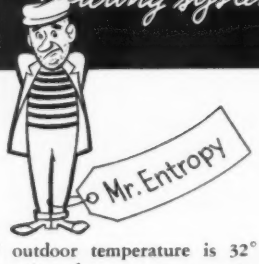
STEAM HEATING QUIZ

Q: What type of steam heating system saves 20% on the fuel bill in the Elgin, Illinois, school system?

A: SELECTOTHERM — Illinois Engineering's vacuum heating system.



If outdoor temperature is 32° it just doesn't make sense to generate and circulate steam at the same high temperature required when the outdoor temperature is 0° F. Selectotherm eliminates this waste by supplying steam at the proper temperature for use at any outdoor temperature condition.

Selectotherm features a single dial control for simplicity of operation. The heating system is "Tuned in With The Weather" by this single dial setting—no "gadgets" to operate or maintain.

Selectotherm can be applied to new construction or is ready to go to work in older buildings—regardless of fuel or mechanical firing device.

Get all the facts. Write for Selectotherm booklet, *Boiler Room Ballad.*

SELECTOTHERM
HEATING CONTROL SYSTEM ®

A product of Illinois Engineering Co.
Division of American Air Filter Co., Inc.
2035 South Racine Ave., Chicago 8, Illinois

chief project engineer; L. E. Caldwell, contracts; F. G. Ralls, chief architectural designer; and G. W. Savage and W. G. Coombe, project directors.

The company is planning a new building in Dearborn which will house all the departments – offices, workrooms, drafting rooms, printing room, and employee facilities.

Martin A. Mayers, formerly chief mechanical engineer, special projects, at Burns and Roe, Inc., is now chief mechanical engineer of Sanderson and Porter, New York City.

Tammen and Denison, Inc., Chicago consulting engineers and industrial designers, are moving to 4751 North Olcott Avenue. The new building offers more space for the computing center, engineering activities, and fabrication of specialized electronic equipment.

Three representatives of senior British engineering institutions—the Institution of Civil Engineers, the Institution of Mechanical Engineers, and the Institution of Electrical Engineers – will time their globe-girdling tour to arrive in New York for the Conference of Engineering Societies of Western Europe and the United States, scheduled April 26 through May 4. Other members of the British Institutions are coming directly from England for the conference.

Badger Manufacturing Company, Cambridge engineering and construction firm, has named Dr. James S. Carey and Philip H. Seaver to the board of directors. Anson W. Krickl, manager of the manufacturing division, was elected a vice president.

The 1958 Jacob F. Schoellkopf Medal of the Western New York Section of the American Chemical Society will be awarded Robert Burns MacMullin, senior partner of R. B. MacMullin Associates, consulting engineers, of Niagara Falls, New York. Honored "for contributions to chemical engineering and for achievements in industrial electrolytic processes," MacMullin will receive the medal May 20. MacMullin's firm has received international recognition in the design of chloralkali plants and other electrolytic processes. His most recent plant design, for the Weyerhauser Timber Company, is the largest captive chlorine plant in the pulp and paper industry.

This year's Frank Newman Speller Award in Corrosion Engineering went to a New Orleans consulting engineer, Robert J. Kuhn, for his work on cathodic protection of underground pipelines.

In his career, Kuhn has worked on pipelines thousands of miles long, running as far as Illinois, Indiana, and Ohio. Some steel gas lines, buried in New Orleans for 30 years, have never had a leak because of corrosion or rust.

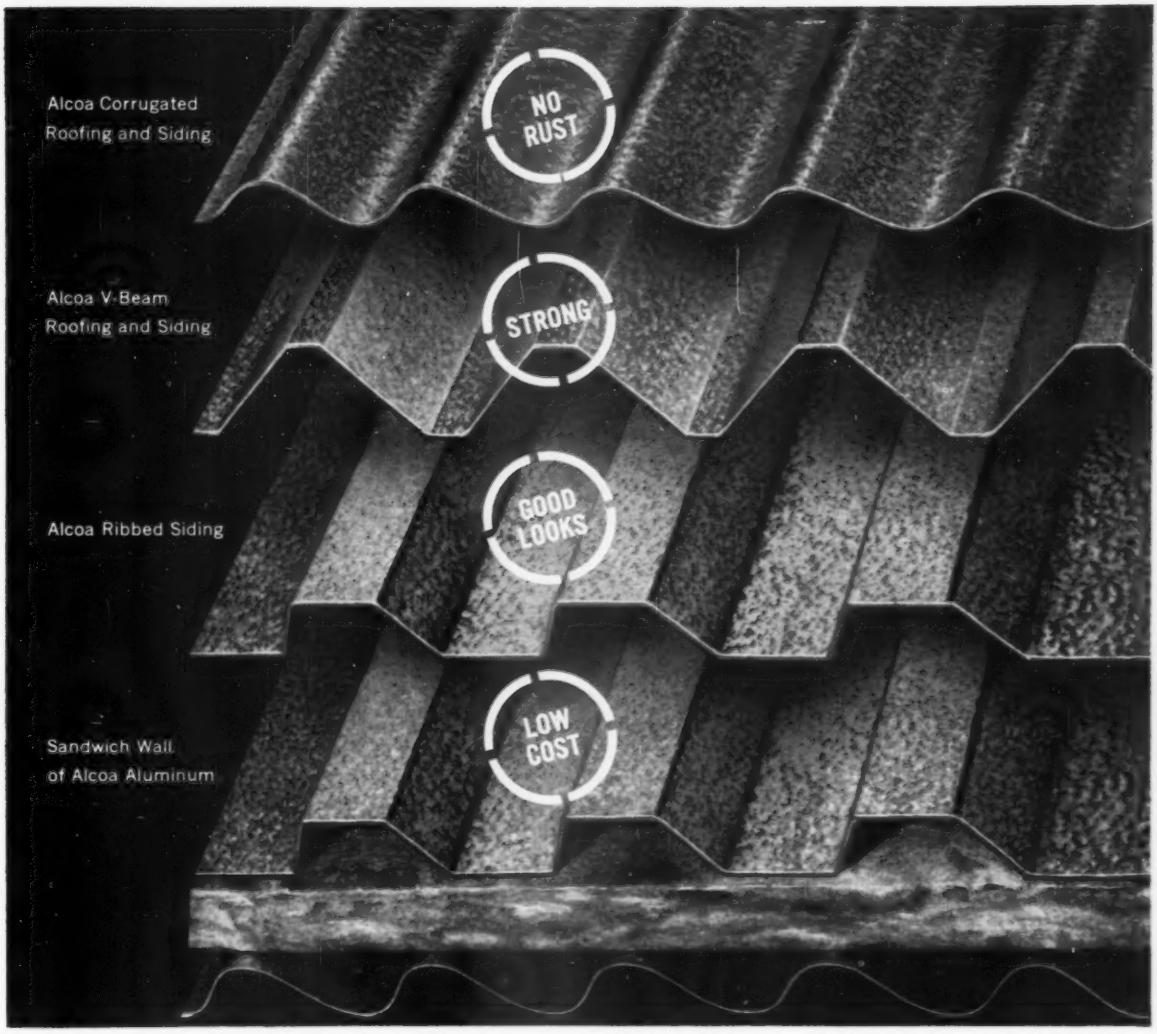
KUHN

KRIEG

Edwin H. Krieg, vice president and consulting engineer, of Stone & Webster Engineering Corp., has been elected a director of the firm.

One of the nation's leading authorities on the design of power plants, Krieg is credited with many advances in technical developments and applications of prototype steam turbine-generators.

Krieg is a Fellow of the American Society of Mechanical Engineers, and a member of National Society of Professional Engineers, American Institute of Electrical Engineers, the Prime Mover Committee, Edison Electric Institute, and other technical organizations. ▲▲



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PLANT CONSTRUCTION IS GOING ALUMINUM

Save construction money now and maintenance costs later with these Alcoa® Aluminum Industrial Building Products and Materials . . . for both new plants and plant expansion:

1. Humid atmospheres and industrial fumes mean nothing to Alcoa Corrugated Roofing and Siding. Once up, that's it! No painting or expensive maintenance of any kind ever needed.

2. Aluminum-clad buildings can be *strong buildings* with Alcoa V-Beam Roofing and Siding. Safely carries 30 lb/-sq-ft uniform load on a 10-ft purlin spacing.

3. Aluminum-clad buildings can be *good-looking buildings* with Alcoa Ribbed Siding. This configuration makes buildings clean-lined with good vertical shadows.

4. Sandwich wall of Alcoa Aluminum is the lowest cost insulated metal wall system known: With a "U" value of .155, it has three times the insulating value of 8-in. brick. Goes up fast, too. Permits economical air conditioning.

All of these materials offer the benefits inherent in aluminum—corrosion resistance, low cost and good looks. They are sold and erected by Alcoa Approved Applicators. For the name of the Applicator near you, contact your Alcoa sales office, or write: Aluminum Company of America, 864-E Alcoa Building, Pittsburgh 19, Pennsylvania.

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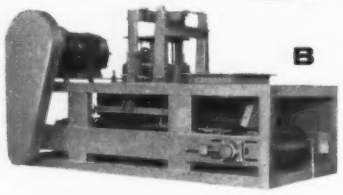
Your Guide to the Best in Aluminum Value

"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

UNITIZED
WEIGHER-FEEDER

Building-block design gives custom-made utility at an off-the-shelf cost

A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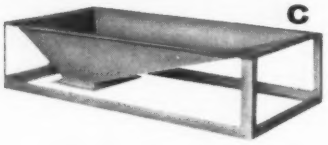
C

UNITIZED construction makes the W-C Weigher-Feeder readily adaptable to practically any processing setup. Components are standardized, proven and interchangeable . . . pre-engineered with virtual "plug-in" simplicity.

A The UPPER FRAME controls material input, is supplied with a rotary feeder, sliding gate, vibratory feeder or other mechanism matched to material and flow requirements.

B The CONVEYOR FRAME, where material is weighed, includes a complete conveyor section, weighing pan and transmitter with integral tare adjustment. W-C's system of flexure mountings assures accurate measurement despite uneven loading or pile-ups. There are no knife-edges, beam pivots or other points of concentrated wear to affect accuracy.

C The LOWER FRAME is optional; can be a simple chute as shown.

In addition, the W-C Weigher-Feeder is designed to handle such instrument-controlled functions as flow totalizing, recording, programming, and material proportioning. Units are also available for installation on existing conveyors.

Complete information is given in Catalog 12. Write for a copy

W-C

S.A. 1667

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By Consulting Engineers

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Polglaze & Basenberg, Engineers
Birmingham, Alabama
¶ Water works improvements, (civil) $2.1 million. Client, Municipal Utilities Board, Decatur, Ala.
¶ Sanitary sewerage improvements. (civil) $1.9 million. Client, City of Decatur, Ala.

Hazzard, McRoy & Cone
Birmingham, Alabama
¶ Saint Margaret's Hospital, Montgomery, Ala. (elec.) $200,000. Client, C. H. McCouley, Arch.
¶ University of Alabama fieldhouse, Tuscaloosa, Ala. (mech., elec.) $300,000. Client, Miller Martin & Lewis, Arch.

ARIZONA

Bridgers and Paxton
Albuquerque, New Mexico
¶ Solar-heated residence, Phoenix, Ariz. (mech.) $40,000. Client, Association for Applied Solar Energy.

CALIFORNIA

George S. Erskine
Menlo Park, California
¶ Radio shop, lubrication building, and wash rack. (mech., elec.) $40,000. Client, San Mateo County.

M. K. Goldsmith
Los Angeles, California
¶ Church of Religious Science, Los Angeles, Calif. (struc.) $1 million. Client, Paul R. Williams, Arch.
¶ Bay apartments, Long Beach, Calif. (struc.) $3 million. Client, Paul R. Williams, Arch.
¶ Franz Hall, U.C.L.A., Los Angeles, Calif. (struc.) $1,250,000. Client, Paul R. Williams, Arch.
¶ Marina Del Rey Junior High School, Los Angeles, Calif. (struc.) $2.5 million. Client, Paul R. Williams, Arch.

Hugh B. Brewster
Fresno, California
¶ Preliminary report, design, plans, and specifications for 275-ft prestressed concrete bridge, and realign road at Pine Flat Road crossing Sycamore Creek. (civil) $138,000. Client, Fresno County.

Lorenzo Kennon
South Laguna, California
¶ Design waterjet-powered propulsion unit for frogmen and skin-divers. (mech.) Client, Associated Factories Corp.

R. E. Layton & Associates
San Leandro, California
¶ Design and construction supervision of storage facility, 80,000 sq ft floor area, timber construction. (civil, struc.) $250,000. Client, Hunt Foods, Inc.

Cline, Zerkle & Agee
Berkeley, California
¶ Six-classroom addition to Nightingale School. (civil, struc., mech., elec.) $76,000. Client, Orcutt Union School District.
¶ Manufacturing building for Sprague Electric Co., Visalia, Calif. (civil, struc., mech., elec.) $93,500. Client, Sprague Electric Co.

COLORADO

Henningson, Durham & Richardson
Colorado Springs, Colorado
¶ Municipal paving, Cortez, Colo. (civil) $400,000. Client, City of Cortez.
¶ Municipal paving, Durango,

ONLY JENN-AIR EXHAUSTERS OFFER TRUE LOW CONTOUR

The Big Difference is in the Installed Height

To conform with modern construction, low contour in exhausters is the accepted design among architects, engineers and building owners. And Jenn-Air, first to develop low contour spun aluminum exhausters, still engineers the lowest contour of all. Only true measurement of exhauster height is the distance from the roof level to the top of the exhauster. Jenn-Air Quiet-Tested units, when installed, stand 25 to 50% lower than others—yet meet specifications for a discharge height at least 16″ above roof level. This is achieved by Jenn-Air's exclusive method of nesting the motor below the discharge of the exhauster. Thus, the base of the exhauster itself supplies the additional height. In competitive models, with a discharge height of only 9½″, the curb base must be extended higher to attain the 16″ position. Result: overall, installed height of competitive so-called "low contour" exhausters runs 8″ to 10″ more than that of Jenn-Air. Have a Jenn-Air representative show you the "yard-stick test" . . . proof positive that only Jenn-Air Quiet-Tested exhausters offer *true* low contour.

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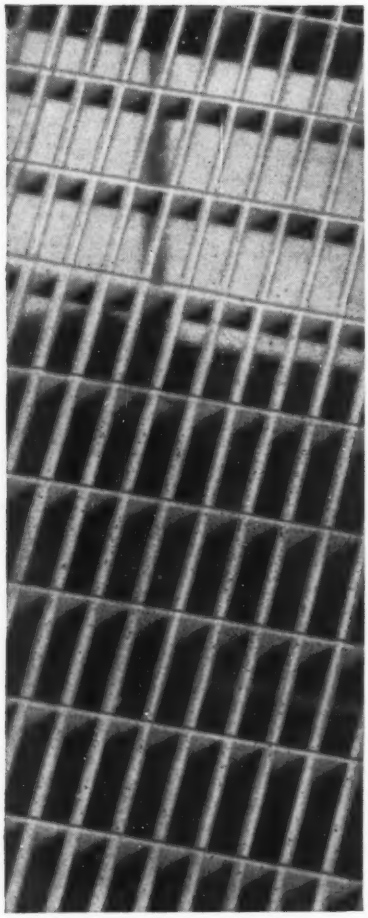

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takes the load
but not the light

Hendrick Mitco takes the brunt of heavy, continuous industrial or pedestrian traffic without bending or warping. Yet, its 90% open area lets in plenty of light and air. Mitco is pressure-formed to give it this high strength—and as a result, extremely long life. For more information, write direct to your local sales office.

Hendrick Mitco . . . *the grating with the Deep Cross Bar*

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Colo. (civil) $1 million. Client, City of Durango.

CONNECTICUT

Abbott, Merkt & Company
New York, New York
¶ Store addition, bridge over street, and warehouse addition, Hartford, Conn. (arch., civil, struc., mech., elec.) $6 million. Client, G. Fox & Company.

DISTRICT OF COLUMBIA

Henry Adams, Inc.
Baltimore, Maryland
¶ 2000-ton air conditioning plant and complete revision and rehabilitation of electrical distribution system, Government Printing Office, Washington, D.C. (mech., elec.) Client, General Services Administration.

Penniman & Browne, Inc.
Baltimore, Maryland
¶ Soil investigation for four school sites in Washington, D.C. Client, Department of Buildings and Grounds, District of Columbia.

FLORIDA

Aake F. Hedman & Associates
Chattanooga, Tennessee
¶ Bridges in Tampa, Fla. (struc.) $1.2 million. Client, City of Tampa.

Hazzard, McRoy & Cone
Birmingham, Alabama
¶ Pensacola Baptist Hospital, Pensacola, Fla. (mech., elec.) $350,000. Client, C. H. McCouley, Arch.

Mitchell-Gordon Associates
Coral Gables, Florida
¶ Consumers' service building addition to Miami International Airport terminal, Miami, Fla. (mech., elec.) $3,335,000. Client, Steward-Skinner Associates, Arch.
¶ Biscayne Gardens Junior High School, Miami, Fla. (mech., elec.) $900,000. Client, Steward-Skinner Associates, Arch.
¶ Ten-story San Souci apartment building, North Miami, Fla. (mech. elec.) $1.5 million. Client, Walter W. Baggesen, Arch.
¶ Two-story emergency building, Jackson Memorial Hospital, Miami, Fla. (mech., elec.) $600,000. Client, Steward-Skinner Associates, Architects.
¶ Two-story addition to Holy Cross Hospital, Fort Lauderdale, Fla. (mech., elec.) $300,000. Client, Steward-Skinner Associates, Arch.
¶ Miami Shores Presbyterian Church, Miami Shores, Fla. (mech.) $450,000. Client, Irving E. Horsey, Arch.

IDAHO

Davenport Engineers
Caldwell, Idaho
¶ Design and layout of sewer system. (civil) $93,000. Client, Village of Marsing, Idaho.
¶ Survey and planning for street improvement program. (civil) $150,000. Client, City of Payette, Idaho.

ILLINOIS

Charles N. Debes and Associates
Rockford, Illinois
¶ Shopping center, 120 x 250 feet, Aurora, Ill. (struc., mech., elec.) $250,000. Client, Piggly Wiggly.

LOUISIANA

The Fluor Corporation, Ltd.
Los Angeles, California
¶Design, engineer, and construct 150-million cfd gas processing facility near New Orleans, La. $3 million (est.). Client, Texas Natural Gasoline Corp. and Tennessee Gas Transmission Co.

Ogden, Woodruff and Dyer, Inc.
Baton Rouge, Louisiana
¶ Office building for Louisiana Highway Department, Baton Rouge, La. (mech., elec.) $3 million (total). Client, A. Hays Town, Architect.

MARYLAND

Henry Adams, Inc.
Baltimore, Maryland
¶ Air conditioning and related work, post office and courthouse, Baltimore, Md. (mech., elec.) $1.2 million. Client, General Services Administration.
¶ Hutzler-Westview department store, Baltimore County. (mech.,

GILSULATE® Pipe Insulation Digest

FOR UNDERGROUND HOT PIPES

Analyze costs of seven insulation systems

Case Tech chooses Gilsulate

When one of the nation's top technical schools selects your product after long laboratory and field tests you have a right to be proud.

We're doubly proud of Gilsulate: it's been chosen by Case Institute of Technology in Cleveland as the underground hot pipe insulation for its major expansion program—and for rehabilitation of all steam distribution systems on the campus as the need arises.

Case is only one instance of major Gilsulate installations at leading schools, colleges, training centers and other large institutional centers. You will also find Gilsulate protecting underground hot lines in every type of industry, in all parts of the country.

The trend is to Gilsulate. Write for complete details and learn why.

300-FOOT REPLACEMENT LINE going in at Case. Note forms around pipe to conserve Gilsulate.

GILSULATE IS THE SIMPLEST TO INSTALL of any underground hot pipe insulation. An illustrated wall chart, "How To Install Gilsulate," showing the 10 simple steps to follow, has been prepared. We will be glad to send you a copy on request.

How to select underground hot pipe insulation

There are at least 11 important points to look for in choosing insulation for underground hot piping systems. Users' experience with Gilsulate and other insulations under all and varied conditions proves that Gilsulate can out-perform all others. The 11 points are:

1. High resistance to both conductive and radiant heat flow.
2. Stable and non-corrosive in air, acid and alkaline soils, and salt water.
3. Good dielectric.
4. Moisture-proof and vapor-proof *without* jacketing or sealing.
5. Uses readily available materials both in manufacture and installation.
6. Easy and rapid to install, with a minimum of skill and effort.
7. Structural stability under vibration, dead and live loads, during shipping, storage, installation and operation.
8. Adaptable through a wide range of temperatures.
9. Allows pipe to expand and contract.
10. Allows system to be repaired and altered easily.
11. Allows piping leaks to be detected readily.

Gilsulate costs less per installed linear foot than *seven* different types of underground distribution systems, according to a report given by R. D. Hummel at the annual meeting of the National District Heating Association. Mr. Hummel is Manager, Division of Engineering, Yale University.

Based on installations of 1,000 feet of 8-in. welded steam line, and 4-in. welded return, Gilsulate costs $27 per linear foot, including the pipe, digging and insulation. The table below lists the systems compared, and costs.

System	*$Cost/ft.*
Gilsulate	27
Product A, with concrete fill	32
Tile conduit; pipe insulated with magnesia, and wrapped	32
Pipe insulated with magnesia and having metal jacket with protective coating	32
Reinforced concrete pipe over concrete slab, with wrapped magnesia insulated pipe	35
Precast slab envelope with magnesia insulated pipe within	42
Walk-through tunnel with magnesia insulation on lines	120

Here again is convincing proof that poured-in-place Gilsulate drastically cuts underground hot pipe insulation costs, with top corrosion protection and thermal efficiency. Gilsulate's high resin content, water-repellent properties, resistance to all corrosive elements normally found in soil, and high insulating value are unique. No wonder Gilsulate is the ideal—and most economical—solution to underground hot piping insulation problems!

Note: A complete account of Mr. Hummel's talk will be found in the Spring 1957 issue of PIPE INSULATION NEWS, available on request.

American Gilsonite Company

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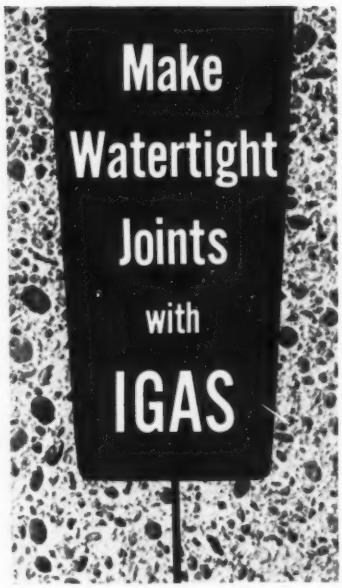
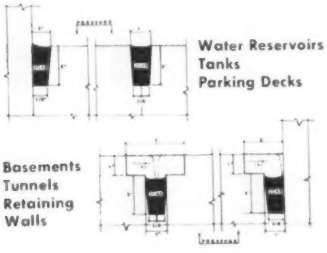
Eastern office: 3537 Lee Road, Cleveland 20, Ohio
Distributors in principal countries of the world
Affiliate of Barber Oil Corporation and Standard Oil Company of California

All of these items appeared in PIPE INSULATION NEWS. To keep abreast of money-saving hints and developments in underground hot pipe insulation, ask to be put on our mailing list.



Igas Joint Sealer is a non-meltable, mastic waterstop that is easily applied to joints after the concrete has hardened. Igas will not dry out or become brittle when subjected to climatic changes. It can be placed in vertical, horizontal and overhead joints, thus forming an effective, watertight seal. Igas is ideal for foundations, basements, swimming pools, tunnels, etc. For complete information about Igas, write for Bulletin IS-56.



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elec.) $1.4 million. Client, Westview Shopping Center, Inc., and Hutzler Brothers Co.

Penniman & Browne, Inc.
Baltimore, Maryland
¶ Subsurface exploration at proposed South River bridge site, Riva, Anne Arundel County, Md. Client, Anne Arundel County and Turpin, Wachter, & Associates.

McCormick, Taylor Associates
Philadelphia, Pennsylvania
¶ Office building for Government Employee's Insurance Co., Bethesda, Md. (struc.) $5.5 million. Client, Vincent G. Kling.

MICHIGAN

Finkbeiner, Pettis & Strout
Toledo, Ohio
¶ Sewage treatment plant. (civil, mech., elec.) $175,000. Client, Village of Chelsea, Mich.

Stuart D. Long
Grand Rapids, Michigan
¶Grand Traverse medical care facility; offices and laboratories housed in basement and ground floors, patients' rooms on second and third floors. Separate laundry building will serve two hospitals. $1 million. Client, Harford Field, Architect.
¶ Campus-type senior high school with 7 buildings, 52 classrooms, gym, auditorium, 3 shops, cafeteria, library building, canopied walks between buildings, Traverse City, Mich. $2½ million. Client, Gordon Cornwell, Arch.

Michigan Associates
Lansing, Michigan
¶ Relocate U.S. 16 as limited-access highway. $3.6 million. Client, Michigan Highway Department.
¶ Ten structures on U.S. 16 highway project. $2,480,000. Client, Michigan Highway Department.

MISSOURI

Allgeier, Martin & Associates
Joplin, Missouri
¶ Water system program including drilled water well, deep-well turbine pump, pumphouse, elevated storage tank and tower, and water distribution system. (civil) $90,000. Client, City of Exeter, Mo.
¶ Sewerage improvement program including two oxidation basins, two pumping stations, and additions to sewer collecting system. (civil) $210,000. Client, City of Cassville, Mo.

NEBRASKA

Henningson, Durham & Richardson
Omaha, Nebraska
¶ Complete survey of west bank of Missouri River to eliminate stream pollution in accordance with USPHS requirements. $15 million. Client, City of Omaha, Nebr.

NEW HAMPSHIRE

The Clarkeson Engineering Co., Inc.
Boston, Massachusetts
¶ Design Boscawen bridge (over railroad and local road) and Boscawen-Canterbury bridge (over Merrimack River) in connection with improvement and relocation over interstate and U.S. routes. (struc.) $750,000. Client, New Hampshire Department of Public Works & Highways.

NEW JERSEY

Abbott, Merkt & Company
New York, New York
¶ Shopping center, Eatontown, N.J. (arch., civil, struc., mech., elec.) $9 million. Client, Massachusetts Mutual Life Insurance Co.

A. D. Ateshoglou
New York, New York
¶ Temple Sinai, Bergen County, Englewood, N.J. (struc.) $200,000. Client, Bloch & Hesse, Arch.

Melvin H. Friedman & Associates
Bergenfield, New Jersey
¶ Motel with gas fired hot-water heat, central cooling, individual room control, Long Branch, N.J. (mech., elec.) $500,000. Client, L. Moon, Arch.

Kelly & Morris
Jersey City, New Jersey
¶ Jamesburg State Home for Boys, Jamesburg, N.J. Change dc distribution to ac, install new 300-kw diesel generator equipment. (elec.)

Plenty of room for seven large vehicles in this 36' x 112' Stran-Master.

FOR LOW-COST VEHICLE STORAGE . . .

CHOOSE A Stran-Master GARAGE

If your transportation department needs service and storage space—give them firesafe, all-steel housing that meets present demands and easily expands in size later. The Stran-Master building that can do this will cost 30% to 50% less than most other types of construction. And Stran-Steel's five-year purchase plan calls for only one-fourth down. You can own more cheaply than you can rent!

Handsome Stran-Masters also serve as warehouses, factories, retail outlets, utility houses and service shops. Need an inexpensive, low-maintenance building of your own to improve your operation? The production-built, precision-engineered elements to fit your needs can be quickly shipped for fast erection—choice of do-it-yourself construction or dealer's crew.

For all the facts, send for our illustrated catalog or see your Stran-Steel dealer. He's listed in the Yellow Pages under *Steel Buildings* or *Buildings—Steel.*

Exterior view of attractive low-cost Stran-Master building used for commercial vehicle storage.

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FERROLITE is a very hard, yet resilient, acid and waterproof, jointless type of floor finish. FERROLITE can be installed over any type of solid base such as wood, concrete or brick and will withstand concentrated floor loads of over 600 lbs. per square inch without indentation. FERROLITE COLORS are Red, Brown, Gray and Black.

ADVANTAGES —

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APPLICATIONS —

Both the acid-proof and standard FERROLITE Floor Finishes are especially suited for chemical plants, plating rooms, acid processing plants, food plants, paint and varnish plants, in fact wherever chemicals or acids or a combination of both create a flooring problem.

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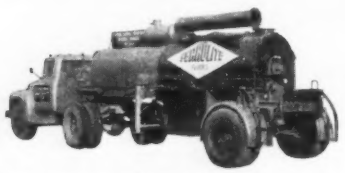
FERROLITE is installed in varying thicknesses of 1" up from thermo-regulated mobile power units especially designed in Europe and now available through Fulton in this country. All Fulton installations are made with our trained floor crews under our supervision which guarantees both quality of workmanship and uniformity of the finished product.



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$150,000. Client, the State of New Jersey.

NEW MEXICO

Darrow-Hodgens & Associates
Odessa, Texas
¶ First Methodist Church, Eunice, N.M. Includes roof structure of hyperbolic paraboloids. (struc., mech., elec.) $200,000. Client, First Methodist Church.
¶ Residence with series of hyperbolic paraboloids, reinforced concrete, Eunice. (struc., mech., elec.) Client, First Methodist Church.

Bridgers And Paxton
Albuquerque, New Mexico
¶ Office building, Santa Fe, N.M. (mech.) $750,000. Client, W. C. Kruger & Associates, Arch.
¶ Catholic high school, Albuquerque, N.M. (mech.) Client, Stanley & Wright, Arch.
¶ Air condition Federal courthouse and post office, Albuquerque, N.M. (mech.) $850,000. Client, General Services Administration (Denver, Colo.).
¶ Church of the Immaculate Conception, Albuquerque, N.M. (mech.) Client, Edward J. Schulte, Architect.
¶ Hospital, including housing and auxiliaries, Shiprock, N.M. (mech.) $2 million. Client, W. C. Kruger & Associates, Arch.

Dr. Marcello Giomi & Associates
Albuquerque, New Mexico
¶ 100-ton absorption refrigeration, air conditioning, and plumbing for Four Hills Country Club, Albuquerque, N.M. (mech.) $350,000. Client, Ferguson-Stevens & Assoc.
¶ Heating, air conditioning, and plumbing for osteopathic hospital, Albuquerque, N.M. (mech.) $350,000. Client, Kruger, Lake & Henderson, Architects.
¶ Air conditioning (138 tons) for Hobbs Junior High School, Hobbs, N.M. (mech.) $600,000. Client, Frank M. Standhardt, Arch.
¶ Air conditioning and plumbing, French-Fitzgerald Mortuary, Albuquerque, N.M. $150,000. Client, Burwinkle & Milner.
¶ Air conditioning and plumbing in Ideal Cement plant and office buildings, Albuquerque, N.M. (mech.) $200,000. Client, Ferguson-Stevens & Associates.
¶ Air conditioning for Aldersgate Methodist Church, Roswell, N.M. (mech.) $150,000. Client, Hugh Rowland, Arch.

NEW YORK

A. D. Ateshoglou
New York, New York
¶ Temple Shaare Torah, Brooklyn, N.Y. (struc.) $400,000. Client, Bloch & Hesse, Arch.
¶ Apartment house, New York, N.Y. (struc.) $1.2 million. Client, Kokkins & Lyras, Arch.

Greenhut & Taffel
New York, New York
¶ Animal husbandry building, New York State College of Agriculture, Cornell University, Ithaca, N.Y. Structural steel. (struc.) $3 million. Client, James C. MacKenzie, Arch. and New York State Department of Public Works.
¶ Penthouse and 20-story building of reinforced concrete, New York, N. Y. (struc.) $1.5 million. Client, Greenberg & Ames, Arch.
¶ Nurses' residence, Metropolitan Hospital, New York, N.Y. Reinforced concrete. (struc.) $2 million. Client, Charles B. Meyers Associates, Arch. and New York City Department of Public Works.

D. Crachi, Jr.
Northport, New York
¶ Road improvements. (civil) $110,000. Client, Village of Westbury, N.Y.

Jacob Feld
New York, New York
¶ 3000-car parking facility ($3 million), Club house ($7.5 million), Yonkers, N.Y. (civil) Client, Yonkers Raceway, Inc.

Galson and Galson
Syracuse, New York
¶ Dining, recreational, and kitchen facilities for 1500 students, 10 major and 12 minor ventilating systems, and provision for 100-ton air conditioning capacity for Neubig Memorial Building, State Teachers College, Cortland, N.Y. (mech., elec.) $1 million (estimated construction cost). Client, C. W. Clark,

positive action against air pollution

Positive action, resulting from an aggressive, industry-wide air pollution policy is rapidly replacing the outmoded philosophy—"wait until someone complains . . . or sues." Today good community relations can be as vital and profitable as increased production efficiency.

Dracco Dust Control Equipment—performance-proved in countless applications—is one of industry's most effective allies in this fight against air pollution. Dracco filtration methods assure 99½-100% air cleaning by trapping dust at its source to prevent both internal and external atmosphere contamination.

The National Supply Company solved an air pollution problem and met the stringent requirements of smog-conscious Los Angeles County. The company installed a special Dracco Dust Control system to prevent escape of waste oxides from its electric furnaces.

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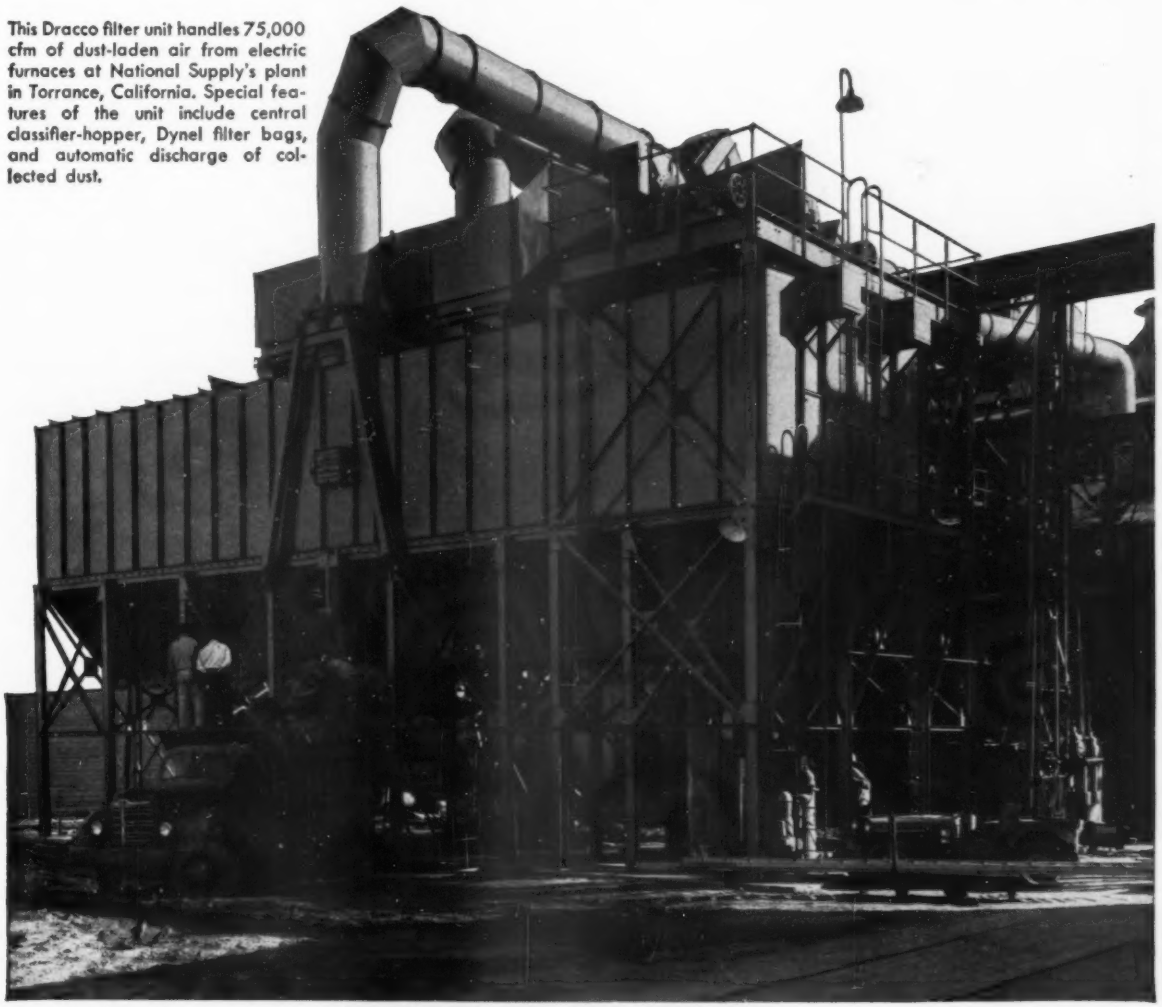
This Dracco filter unit handles 75,000 cfm of dust-laden air from electric furnaces at National Supply's plant in Torrance, California. Special features of the unit include central classifier-hopper, Dynel filter bags, and automatic discharge of collected dust.



Complete 40-page catalog on Dracco Dust Control Equipment contains detailed data and valuable reference material. Write for Bulletin 800.

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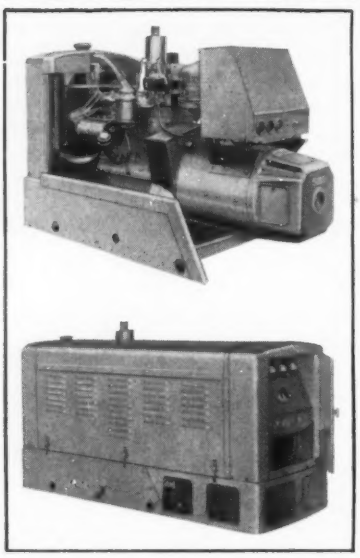

Onan develops new low-cost standby plants

Water-cooled units in 10 and 15 KW sizes meet rigid requirements

A new series of water-cooled electric plants makes Onan reliability and advantages available at significantly lower prices. The new units are powered by the same rugged, industrial-type engines used on more expensive plants. They have close inherent voltage regulation, operate on either gas or gasoline, and are equipped with all necessary controls and instruments, and high water temperature cut-off. Standard Onan accessories are available.

The Onan revolving armature, all-climate generator is direct-connected and self-aligning. All standard voltages are available. Both sizes are offered unhoused or with handsome weatherproof steel housings.

Write for specifications

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ELECTRIC PLANTS

D.W. ONAN & SONS INC.
2744A University Avenue S. E.
Minneapolis 14, Minnesota

Architect, and the Syracuse Dormitory Authority.

P. Anthony Sarubbi, P.E.
Yonkers, New York
¶Hebrew Center, Dobbs Ferry, N.Y. (struc.) $300,000.
¶ Addition to Evangelical Church, Yonkers, N.Y. (struc.) $245,000.
¶ Topographical studies, Westchester County. (civil) $65,000.

NORTH CAROLINA

T. C. Brown & Associates
Raleigh, North Carolina
¶ Pool, gym, dormitory, kitchen, cafeteria, offices, game room in new YMCA, Raleigh, N.C. (mech., elec.) $1.7 million. Client, Leif Valand, Arch.

Carson G. Jennings, Struc. Engineers
Durham, North Carolina
¶ 150-bed general hospital, Elizabeth City, N.C. (struc.) $1.9 million. Client, George Watts Carr, Architect.

OHIO

Finkbeiner, Pettis & Strout
Toledo, Ohio
¶ Sewage treatment plant survey and report. (civil, mech., elec.) Client, City of Bowling Green, Ohio.
¶ Intercepting sewers and sewage treatment plant. (civil, mech., elec.) $250,000. Client, Village of Monroeville, Ohio.
¶ Water supply and sewerage report. (civil, mech., elec.) $20 million (est.). Client, City of Toledo and Lucas County, Ohio.
¶ Campus sewer system, Bowling Green State University, Bowling Green, Ohio. (civil) $500,000. Client, State of Ohio.
¶ Sewage treatment plant survey and report. (civil) Client, City of Bryan, Ohio.

Hoffman, Troy & Ferguson
Toledo, Ohio
¶ New steam generating plant with two stoker-fired water tube boilers, garbage and refuse incinerator, and electrification of pumps and ventilating supply fans, Scott High School, Toledo, Ohio. (struc., mech., elec.) $135,000. Client, Toledo Board of Education, Toledo, Ohio.

OREGON

John H. Brewer
Albany, Oregon
¶ 100-ton sulphite bleach plant (two stages), Oregon City, Ore. (struc., mech., elec.) $450,000. Client, Publishers Paper Co.

PENNSYLVANIA

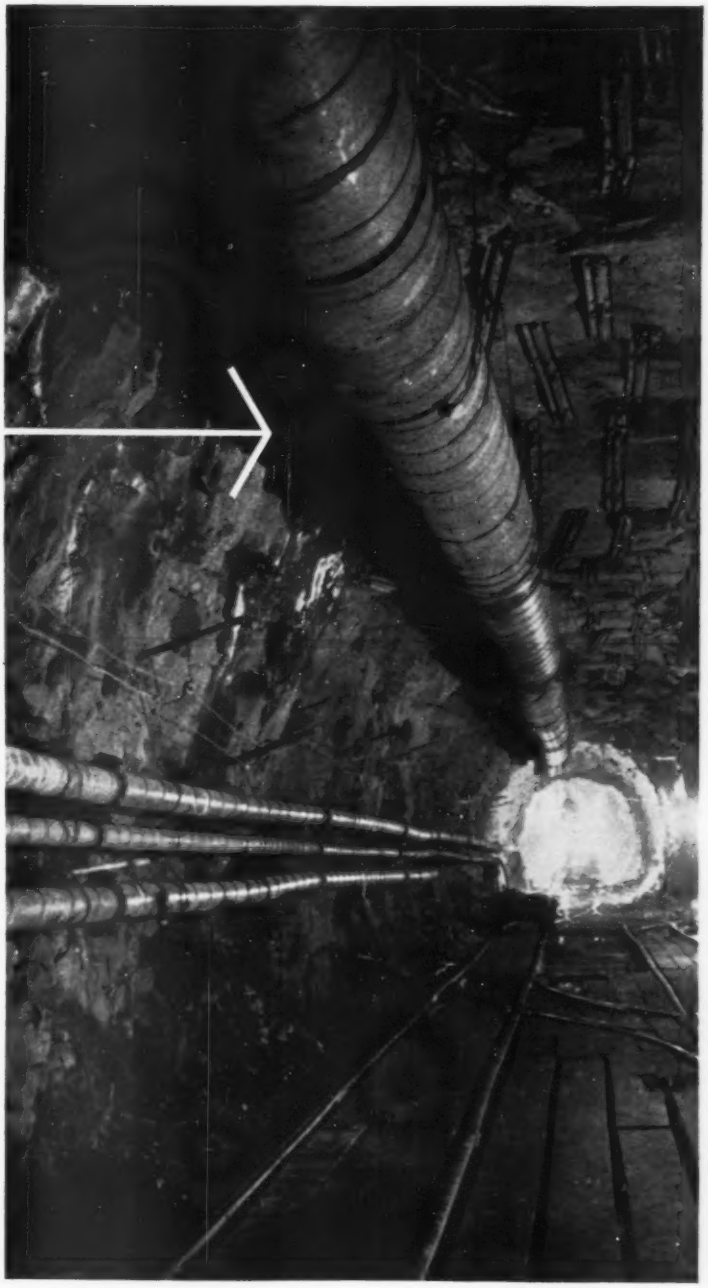
McCormick, Taylor Associates
Philadelphia, Pennsylvania
¶ Eastern Pennsylvania State School, Philadelphia, Pa. (struc.) $7.5 million. Client, V. G. Kling.
¶ William Penn Memorial Museum, Harrisburg, Pa. (struc.) $10 million. Client, Lawrie & Green.
¶ Ebensburg State School, Ebensburg, Pa. (struc.) $4.2 million. Client, Clayton J. Lappley.
¶ Sacred Heart Hospital, Chester, Pa. (struc.) $3.2 million. Client, Henry D. Dagit & Sons.
¶ State Hospital, White Haven, Pa. (struc.) $7.5 million. Client, Boulware & Ewing.
¶ Misericordia Hospital, Philadelphia, Pa. (struc.) $3.7 million. Client, Edward L. Holland.
¶ Pottstown bypass, Berks County, Pa. (struc.) $2 million. Client, Commonwealth of Pennsylvania.
¶ West Chester Pike, Chester County, Pa. (struc.) $5.9 million. Client, Commonwealth of Pennsylvania.

Eugene J. Aufiero, P.E.
Harrisburg, Pennsylvania
¶ Catholic high school, Lebanon, Pa. Steel frame with steel joist floors and roof. Steel rigid frames over auditorium-gym. (struc.) Total cost: $800,000; structural, $90,000. Client, Starr & Long, Arch.

Abbott, Merkt & Company
New York, New York
¶ Service building and 6-story bridge over street, Philadelphia, Pa. (arch., civil, struc., mech., elec.) $2.5 million. Client, Strawbridge & Clothier.

Ebert and Park
Pittsburgh, Pennsylvania
¶ Western Pennsylvania State

UNDERGROUND AIR EXPRESS



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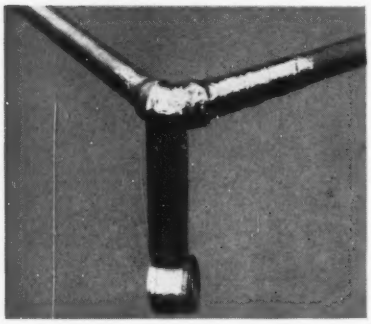

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¶ Federal housing project, McKeesport, Pa. (mech.) $4.5 million. Client, Celli-Flynn, Arch.

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Pittsburgh, Pennsylvania
Woodville State Hospital, Pittsburgh, Pa. (mech., elec.) $1,875,000. Client, Button & McLean.

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¶ Draytonville elementary school, Draytonville, S.C. (mech.) $200,000. Client, Van Wageningin & Cottrac, Arch.

Campbell & Leppard
Greenville, South Carolina
¶ Officials' residences, Clemson College, Clemson, S.C. (mech., elec.) $22,000. Client, Charles Fant & Sons, Arch.

¶ Renovation of electrical system, Newberry County Bank Building, Newberry, S.C. (elec.) $5995. Client, Bankers Realty Co.

¶ Pleasantburg shopping center, Greenville, S.C. (mech., elec., plumbing) $63,400. Client, Leon LeGrand, Arch.

¶ Belle Meade elementary school, Greenville, S.C. (mech., elec., plumbing) $76,000. Client, Charles Potter, Inc., Arch.

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¶ Weave room ventilating system for Appleton plant of J. P. Stevens & Co., Greenville, S.C. (mech.) $41,600. Client, J. P. Stevens & Co.

¶ Weave room ventilating and office air conditioning systems for Monoghan plant of J. P. Stevens & Co., Inc., Greenville, S.C. (mech., elec.) $14,580. Client, J. P. Stevens & Co., Inc.

¶ John Knox Presbyterian Church, Greenville, S.C. (mech., elec.) $24,877. Client, Charles Fant & Sons, Arch.

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Aake F. Hedman & Associates
Chattanooga, Tennessee
¶ Bridge and approaches across Tennessee River, Chattanooga, Tenn. (struc.) $7.5 million. Client, Tennessee Highway Department.

¶ Bridges on freeway through Chattanooga, Tenn. (struc.) $8 million. Client, Tennessee Highway Department.

¶ Highway bridge in Blount County, Tenn. (struc.) $60,000. Client, Blount County Highway Comm.

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Albuquerque, New Mexico
¶ Shopping center, Odessa, Texas, (mech.) $500,000. Client, Gordon McCutchan, Arch.

¶ First Christian Church, Midland, Texas. (mech.) $600,000. Client, Pierce, Norris & Pace, Arch.

Collins Engineering Company
San Antonio, Texas
¶ Paving project – reconstruction of 76 blocks in San Antonio, Texas. (civil) $225,000. Client, City of San Antonio.

Charles R. Haile Associates
Houston, Texas
¶ Paving and storm sewers. (civil) $250,000. Client, City of Texas City, Texas.

¶ Improvements to water system ($320,000) and sewerage system ($350,000). (civil) Client, City of Silsbee, Texas.

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¶ Scott Theater and shops (structural steel) Odessa, Texas. (struc., mech., elec.) $400,000. Client, Scott Theaters, Inc.

¶ Belmont Baptist Church (structural steel) Odessa, Texas. (struc., mech., elec.) $500,000. Client, Belmont Baptist Church.

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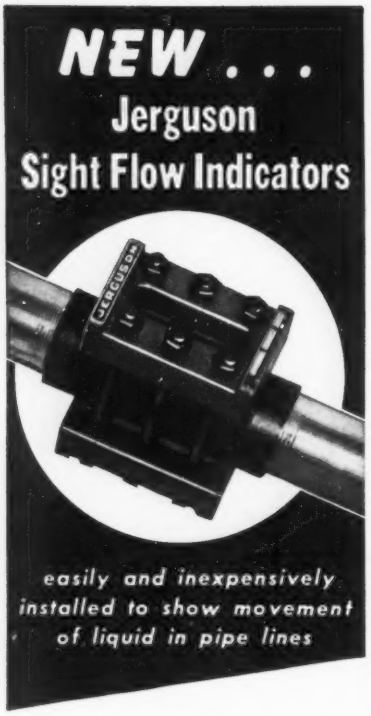

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elec.) $1.5 million. Client, Scott Theaters, Inc.

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San Antonio, Texas
¶ Urban expressway, section of U.S. 81, San Antonio, Texas. (civil, struc.) $2.8 million. Client, Texas Highway Department.

Dunbar & Dickson, Engineers
Freeport, Texas
¶ Concrete ground storage tank. $70,000. Client, City of Lake Jackson, Texas.

VIRGINIA

Appalachian Consulting Engrs., Inc.
Kingsport, Tennessee
¶ Design and structural plans for high school, Abingdon, Va. (struc.) $1,250,000. Client, Beeson & Beeson, Arch.
¶ Design and structural plans for high school, Appalachia, Va. (struc.) $1 million. Client, Beeson & Beeson, Arch.
¶ Addition to existing high school, Bristol, Va. Structural steel and reinforced concrete. (struc.) $650,000. Client, C. B. Kearfott, Arch.

Penniman & Browne, Inc.
Baltimore, Maryland
¶ Subsurface exploration for James River Bridge, Jordon Point, Hopewell, Va. Client, Virginia Highway Dept. and Hardesty & Hanover.

Polglaze & Basenberg, Engineers
Birmingham, Alabama
¶ Sewage treatment plant and sewers. (civil) $900,000. Client, City of Charlottesville, Va.

Wiley & Wilson
Lynchburg, Virginia
¶ Plans and specifications for sewage collection and disposal facilities. (civil, struc., mech., elec.) $4.5 million. Client, City of Lynchburg, Va.
¶ Sewage collection and disposal facilities. (civil, struc., mech., elec.) $1.1 million. Client, Town of Pulaski, Va.
¶ Impounding dam. (civil, struc.) $660,000. Client, Town of Pulaski, Virginia.
¶ Sewage collection and disposal facilities. (civil, struc., mech., elec.) $960,000. Client, City of Radford, Va.
¶ Filter plant addition. (civil, struc., mech., elec.) $350,000. Client, City of Radford, Va.
¶ Sewage treatment plant addition. (civil, struc., mech., elec.) $400,000. Client, City of Staunton, Va.
¶ Waterworks and sewage treatment plant addition. (civil, struc., mech., elec.) $880,000. Client, City of Williamsburg, Va.
¶ Water supply dam and improvements. (civil, struc.) $1 million. Client, City of Harrisonburg, Va.
¶ 36-in. water main connection to Washington, D.C. system. (civil, struc., mech., elec.) $400,000. Client, City of Falls Church, Va.
¶ Branch bank. (civil, struc., mech., elec.) $100,000. Client, Lynchburg National Bank & Trust Co.
¶ Power plant addition. (civil, struc., mech., elec.) $525,000. Client, Virginia Polytechnic Institute.
¶ New River Valley Airport serving Dublin-Radford-Pulaski, Va. (civil, struc., mech., elec.) $550,000. Client, New River Valley Airport Authority.

Nathan C. Hale Associates
Falls Church, Virginia
¶ Water treatment facilities. (civil, struc., mech., elec.) $350,000. Client, Town of Tasewell, Va.

WYOMING

Bishop & Sprulock
Lander, Wyoming
¶ Water distribution and sewage collection and disposal systems. (civil) $175,000. Client, Town of Big Piney, Wyo.
¶ Extension of existing water distribution and sewage collection system; construction of sewage-disposal facilities. (civil) $180,000. Client, Town of Pinedale, Wyo.
¶ Sewage disposal facilities. (civil) $100,000. Client, Town of Lander, Wyoming.

FOREIGN

William R. Jahnke
Pittsburgh, Pennsylvania
¶ Union church and school, Santurce, Puerto Rico. (mech., elec.) $330,000. Client, Schmidt & McDade. ▲▲

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Books

For the Libraries of Consulting Engineers

RADIATION SHIELDING, by B. T. Price, C. C. Horton, and K. T. Spinney; Pergamon Press; 350 pp.; $10.00.

Reviewed
by
Karl H. Puechl
Manager, Theoretical Department
Associated Nucleonics, Inc.
a Subsidiary of
Stone & Webster Engineering Corp.
Garden City, New York

For the shielding expert, the book *Radiation Shielding* affords a worthwhile, comprehensive review. The book deals with the general problem of radiation shielding, not with reactor shielding alone. In addition, it contains a detailed bibliography.

While a physicist well-versed in nuclear theory will find *Radiation Shielding* a convenient starting point for specializing in shield design, an engineer not particularly well grounded in the characteristics of the atom and nucleus will have some trouble applying the information presented. This difficulty arises mainly because elementary theories, such as radioactive build-up and decay and neutron diffusion, are described in detail, while the more elaborate theoretical procedures only are mentioned casually. For this same reason, *Radiation Shielding* does not seem suitable as a college text for advanced undergraduate or graduate students. For anyone who wishes to delve into the details, however, specific references are given.

As a shielding handbook, this volume is a useful complement to the *Reactor Shielding Design Manual,* in that many useful formulas and graphs of both theoretical and experimental results are presented. Although some of this information also is contained in the *Reactor Shielding Design Manual,* much that is worthwhile heretofore could be found only in technical reports and journals. This includes information on capture gamma rays, inelastic cross-sections, and build-up factors for gamma attenuation.

The consulting engineer will find the last chapter particularly useful. Here is given a clear, logical description of how a reactor shield design is evolved. Except for the constant references to equations in other chapters, the presentation is excellent.

As is to be expected from any book covering such a broad scope, it suffers from a number of omissions. For example, in discussing calculation procedures for neutron attenuation, no mention is made of the validity of ordinary multigroup theory. It seems the discussion about calculating radiation leakage from a reactor core could be elaborated upon. Similarly, the discussion of relative biological effectiveness seems to be totally inadequate when one considers that the book

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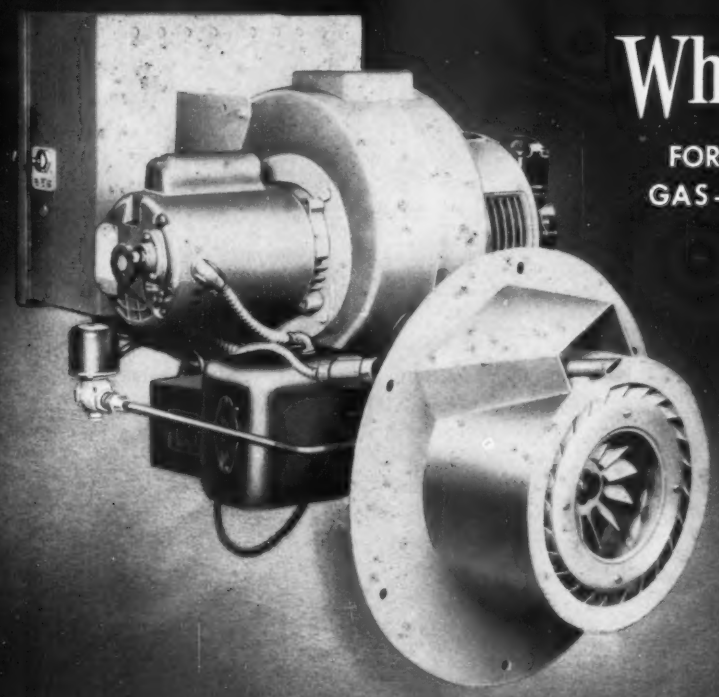

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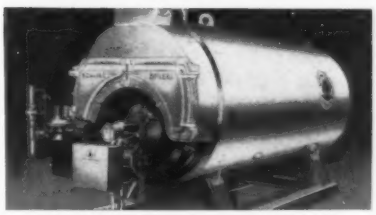

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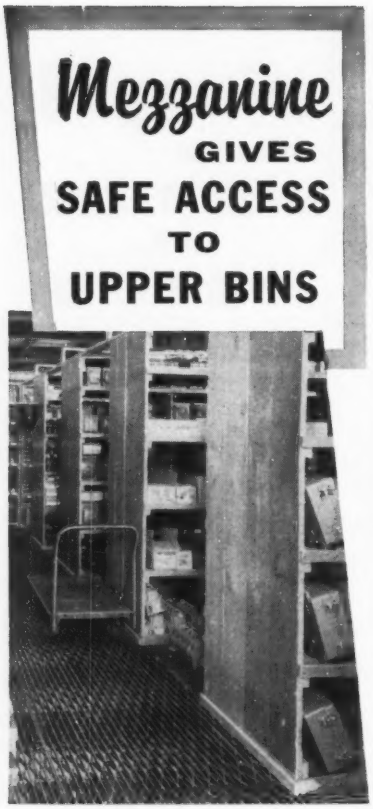

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covers the broad aspects of radiation shielding and not just reactor shielding.

These omissions are counterbalanced to a great extent by some interesting information that has not been presented before in shielding texts. These interesting topics deal mainly with the shielding and scattering of electrons and the associated production of bremsstrahlung and visible light.

The authors write in a clear, unstilted style that is pleasant to read. The result is a true textbook rather than a technical report.

•

SYNTHESIS OF PASSIVE NETWORKS, by E. A. Guillemin; John Wiley and Sons, Inc.; 741 pp.; $15.00.

Reviewed
by
H. E. Gruen
Armour Research Foundation

This book provides the theoretical basis for passive linear network synthesis and describes the more important synthesis techniques. The author intends that this book be one of a series on network analysis and synthesis, and considers the material of two earlier books as a part of the series. He continues in this book his conviction that a basic understanding of the subject is necessary for its proper application. His approach thus is comprehensive, and the mathematical basis is firmly established for all included techniques.

A good understanding of the required mathematics and of basic circuit theory is essential for understanding and using this material. Many examples of various techniques are presented and a large number of practice problems are provided for each chapter. However, the broad application of this material makes it impossible to include detailed application examples, and an additional book on applications is planned.

The first chapter considers the physical aspects of networks and the analytic basis for the study of impedance functions. The characteristics of positive real functions are given in detail, as are the methods of testing for positive real character. Methods of testing for positive real character include use of Hurwitz criteria and also Sturms theorem.

In the following chapters, driving point impedance, transfer functions, and procedures for synthesis of two-element-kind networks are covered. The Foster and Cauer canonic forms of synthesized LC networks are described, as are a variety of techniques useful in synthesis of RC and RL networks. Two chapters are directed to determination of equivalent networks by linear transformation, the determination of potentially equivalent networks, and general properties of two terminal pair networks and their synthesis.

Methods of determining impedance from specific portions, such as the real part, magnitude, and phase angle are described, and the more general methods of synthesis which include the methods of Brune and Darlington are presented in sufficient detail for a clear understanding. Of practical importance is a chapter on transformerless synthesis. The classical methods typically result in requirements for ideal transformers and thus cannot be constructed. The methods of Bott, Duffin, and Miyata are presented. Several interesting variations on these methods are provided by the author. Three chapters are devoted to methods of transfer function synthesis. Lossless networks, lattice structures, and cascaded RC systems are considered.

An important topic covered in detail is the approximation problem. The use of Butterworth and Tschebyscheff functions are described, as are other approximation techniques based on equiripple and linear phase response.

The final chapter discusses time domain synthesis. Computational techniques simplifying correlation of the time and frequency domain

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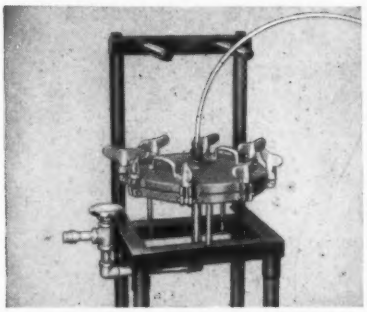

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are developed. Impulse response techniques are used for synthesis.

This book will be of interest to consulting engineers concerned with electrical and control system design, or where electrical analogs of systems are applicable. Handbook or short-cut techniques are not presented and only a thorough understanding of the subject, as can be obtained from this book and reference material, will enable its use.

•

VIBRATION CONTROL, by John N. MacDuff and John R. Curreri; McGraw-Hill Book Co., Inc.; 465 pp.; $9.00.

This book deals with the fundamentals of vibration control necessary to the designer of today's engineering systems. The authors include basic theory and application essential to an engineering understanding and comprehension of the subject fundamentals.

Starting with fundamental principles, the book develops methods of analysis for classical vibrating systems and for systems of interest to the designer. It introduces the reader to differential equations, the impedance method for steady state vibration, the operational calculus and electronic analog computer for transient analysis, and some study of methods for analyzing nonlinear systems.

The authors have drawn upon practical applications and consider the degree of correlation between theory and practice in the development of the theory used. The material in each chapter progresses from elementary consideration of fundamentals to a more thorough and detailed consideration, including numerous examples and problems for self-study or classroom use.

•

INDUSTRIAL NOISE MANUAL, compiled by the Noise Committee of the American Industrial Hygiene Association; 107 pp.; $7.50.

This 10-chapter manual provides a comprehensive coverage of noise, its evaluation, and control. Of particular interest is the chapter on noise control, which includes 35 specific engineering installations showing before and after noise exposures. The manual discusses, among other things, subjects like the physics of sound, sound transmission, measurement of sound, instruments, techniques, procedures for making sound surveys, calibration of instruments, how we hear, effects of noise, why we do not hear, measurement of hearing, medical control and hearing conservation, engineering control of noise, and personal protective measures.

This practical and easy-to-read manual has been written to help the average industrial hygienist or physician, plant or safety engineer, and others to understand and solve their own noise problems.

•

ROLLING OF METALS, by R. B. Palme and C. W. MacGregor; American Society of Mechanical Engineers; $5.00.

This most comprehensive report on stresses in the cold-rolling of metals includes two new discoveries, as well as quantative results of normal stress measurements, efforts to measure contact shear stresses, and complete mechanical properties of the test specimens. The tests were conducted, for the most part, on one-inch square bars of aluminum, copper, and low-carbon steel.

The two new phenomena discovered are occurrence of a marked pressure peak near the entry to the contact arc and frequent occurrence of two distinct pressure peaks, one near entry and one near the exit of the contact arc. Both are unpredictable by existing mathematical theory, according to the report, which includes a tentative explanation for these phenomena.

The experimenters conducted the investigations at MIT. They found it impossible to measure contact shear stresses in the time available (4 years), but a report of their

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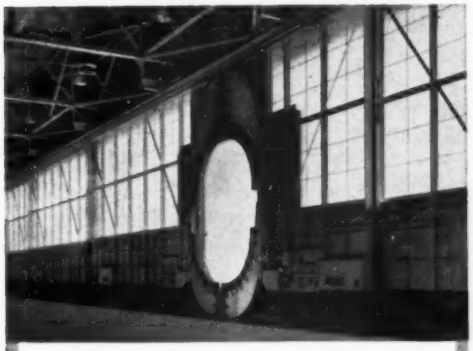

The Byrnaperture consists of a series of movable segments, operated either by hand or electric power, which fit snugly around fuselages from the Convair to the DC-8, Boeing 707, and other large commercial jet planes of the future.

No longer is it necessary to design hangars which must be large enough to house the entire airplane. With the Byrnaperture, a completely weathertight closure is provided for the nose and wings of the plane permitting mechanics to work in complete comfort inside the hangar.

On the basis of hangar building costs—and particularly where large airplanes must be provided for—the Byrnaperture makes possible exceptional economies. This has been definitely proved in every case where Byrne has built doors incorporating this feature.

Here is the newest idea in aircraft hangar design—and it's exclusively Byrne! Let us send you full information and detailed reports of recent installations.

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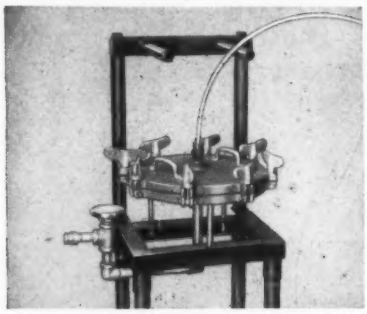

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are developed. Impulse response techniques are used for synthesis.

This book will be of interest to consulting engineers concerned with electrical and control system design, or where electrical analogs of systems are applicable. Handbook or short-cut techniques are not presented and only a thorough understanding of the subject, as can be obtained from this book and reference material, will enable its use.

•

VIBRATION CONTROL, by John N. MacDuff and John R. Curreri; McGraw-Hill Book Co., Inc.; 465 pp.; $9.00.

This book deals with the fundamentals of vibration control necessary to the designer of today's engineering systems. The authors include basic theory and application essential to an engineering understanding and comprehension of the subject fundamentals.

Starting with fundamental principles, the book develops methods of analysis for classical vibrating systems and for systems of interest to the designer. It introduces the reader to differential equations, the impedance method for steady state vibration, the operational calculus and electronic analog computer for transient analysis, and some study of methods for analyzing nonlinear systems.

The authors have drawn upon practical applications and consider the degree of correlation between theory and practice in the development of the theory used. The material in each chapter progresses from elementary consideration of fundamentals to a more thorough and detailed consideration, including numerous examples and problems for self-study or classroom use.

•

INDUSTRIAL NOISE MANUAL, compiled by the Noise Committee of the American Industrial Hygiene Association; 107 pp.; $7.50.

This 10-chapter manual provides a comprehensive coverage of noise, its evaluation, and control. Of particular interest is the chapter on noise control, which includes 35 specific engineering installations showing before and after noise exposures. The manual discusses, among other things, subjects like the physics of sound, sound transmission, measurement of sound, instruments, techniques, procedures for making sound surveys, calibration of instruments, how we hear, effects of noise, why we do not hear, measurement of hearing, medical control and hearing conservation, engineering control of noise, and personal protective measures.

This practical and easy-to-read manual has been written to help the average industrial hygienist or physician, plant or safety engineer, and others to understand and solve their own noise problems.

•

ROLLING OF METALS, by R. B. Palme and C. W. MacGregor; American Society of Mechanical Engineers; $5.00.

This most comprehensive report on stresses in the cold-rolling of metals includes two new discoveries, as well as quantative results of normal stress measurements, efforts to measure contact shear stresses, and complete mechanical properties of the test specimens. The tests were conducted, for the most part, on one-inch square bars of aluminum, copper, and low-carbon steel.

The two new phenomena discovered are occurrence of a marked pressure peak near the entry to the contact arc and frequent occurrence of two distinct pressure peaks, one near entry and one near the exit of the contact arc. Both are unpredictable by existing mathematical theory, according to the report, which includes a tentative explanation for these phenomena.

The experimenters conducted the investigations at MIT. They found it impossible to measure contact shear stresses in the time available (4 years), but a report of their

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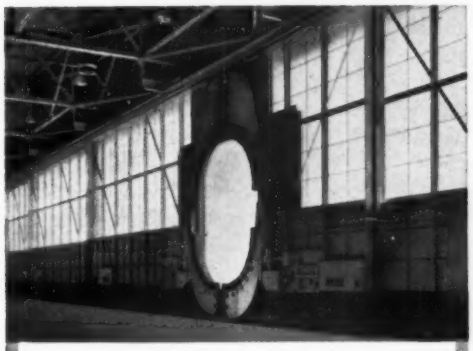

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efforts to do so is included in the book. The results of measuring contact normal stresses for a series of conditions are summarized in tables and curves.

Copies of the book may be ordered from the Research Department, American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y. There is a 20 percent discount for ASME members.

•

HEAT TRANSFER – VOLUME II, by Max Jakob; John Wiley & Sons.

Reviewed
by
Harold A. Blum
Associate Professor,
Mechanical Engineering
Department
Southern Methodist University

This book contains one section on radiation (a continuation of the material in Volume I), another on heat transfer applications, and a final section which has supplemental material to subjects covered in the earlier volume.

Heat Transfer is an excellent text for the expert and the advanced student in heat transfer. It is not the sort of book from which design data can be obtained easily unless the accompanying theory is well understood. Each chapter is introduced simply so that the reader can quickly determine the nature of the coverage. If the indexing could have included material in Volume I, referencing work would be easier.

Important features of the radiation sections are:

¶ Geometry effects. – This starts with elementary theory and leads to workable charts for many practical conditions. An excellent discussion of the experimental methods used for determining angle factors is included.

¶ Effects of absorbing media. – The treatment of this subject is more complete than any other text known to the reviewer. Among the subjects covered are analysis of the applicability of Beer's laws, absorption characteristics of single component and gas mixtures, and experimental techniques.

The applications portion of the text includes:

¶ Thermometry. – This well illustrated section treats simply and thoroughly many phases of temperature measurement theory.

¶ Heat exchangers (recuperators, regenerators, cooling towers). – In addition to the usual treatment of heat exchanger theory, this portion includes discussions of heat transfer in packed columns, cyclical processes, application of the enthalpy-temperature diagram to problem solution.

¶ Packed media. – The chapter on steady flow in packed media provides useful information for material and energy balance calculations on catalytic reactors. This also might be useful to studies of underground heating problems.

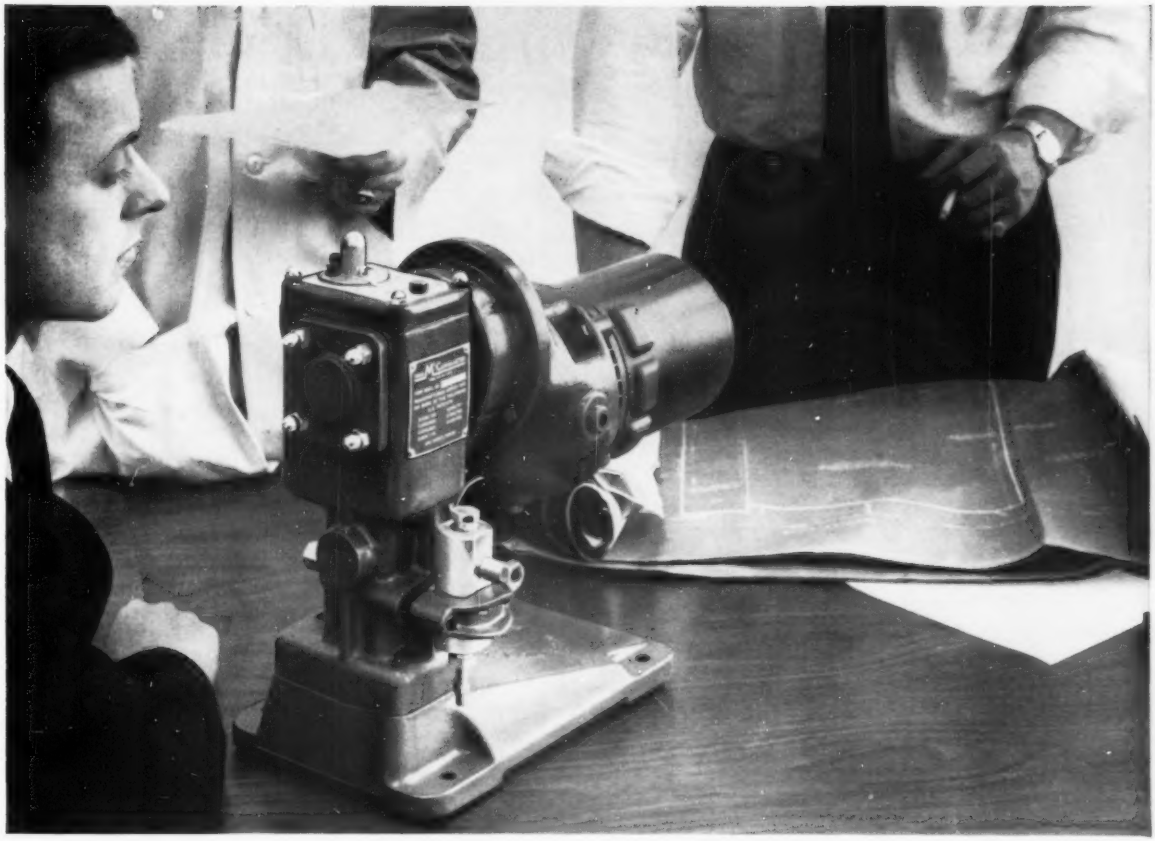
¶ Liquid metals. – Heat transfer theory in liquid metals, applicable to nuclear power development, is covered thoroughly.

¶ Supersonic heat transfer theory. – Consideration of heat transfer in laminar and turbulent layers at supersonic fluid velocities is considered in sufficient detail to make it valuable for the worker in the field of high-speed missiles.

•

"AUTOMATION AND MR. HALSTEAD," General Electric Co., color, 30 min.

This film is based in part upon the company's experience as a supplier of electrical components for a wide range of industries. It ties in with a 44-page manual to show examples of automation demonstrating the growing capabilities of electrical equipment and systems, including descriptions of a new program-controlled milling machine which achieves profitable automation on runs of only two identical pieces, and a recent automatic warehousing installation made more reliable by new static switches. ▲▲



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Consulting Engineers' Calendar

Date	Sponsor	Event	Location
May 1-3	Consulting Engineers Council	Annual Meeting	Sir Francis Drake Hotel San Francisco, Calif.
May 1-8	American Society of Tool Engineers	1958 Tool Show and Annual Meeting	Convention Hall Philadelphia, Pa.
May 5-7	Purdue Union Club	Purdue Industrial Waste Conference	Campus Lafayette, Ind.
May 7-11	Western Air Conditioning Industries Association	Conference and Exhibit	Shrine Exposition Hall Los Angeles, Calif.
May 12-15	Oil and Gas Power Div. of American Society of Mechanical Engineers	Conference & Exhibit	Campus Madison, Wis.
May 19-23	National Fire Protection Association	Annual Meeting	Palmer House Chicago, Ill.
May 25-29	Air Pollution Control Association	Annual Meeting	Sheraton Hotel Philadelphia, Pa.
June 5-6	University of Wisconsin	Institute for Consulting Engineers	Campus Madison, Wis.
June 5-7	Michigan Society of Professional Engineers	Annual Convention	Pantlind Hotel Grand Rapids, Mich.
June 8-18	Society of Automotive Engineers	Summer Meeting	Chalfonte-Haddon Hall Atlantic City, N. Y.
June 12-14	National Society of Professional Engineers	General Meeting	Chase Hotel St. Louis, Mo.
June 15-19	American Society of Mechanical Engineers	Semi-Annual Meeting	Statler Detroit, Mich.
June 22-25	American Institute of Chemical Engineers	50th Anniversary Meeting	Bellevue-Stratford Hotel Philadelphia, Pa.
June 22-27	American Institute of Electrical Engineers	Summer General Meeting	Hotel Statler Buffalo, N. Y.
June 23-25	American Society of Heating and Air-Conditioning Engineers, Inc., and American Society of Refrigerating Engineers	Joint Meeting	Pick-Nicollet Hotel Minneapolis, Minn.
June 23-27	American Society for Testing Materials	Annual Meeting and Exhibit	Hotel Statler Boston, Mass.
June 23-27	American Society of Civil Engineers	Convention	Multnomah Hotel Portland, Ore.

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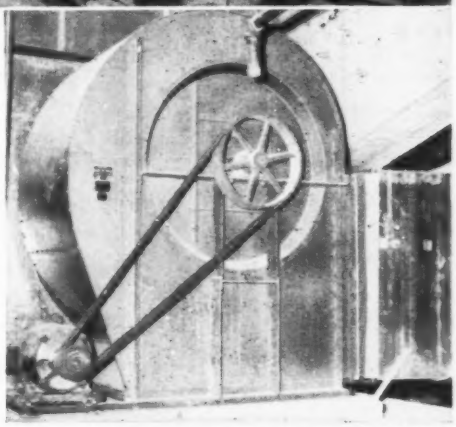
Another Coliseum Chooses Clarage Air Handling and Conditioning Equipment

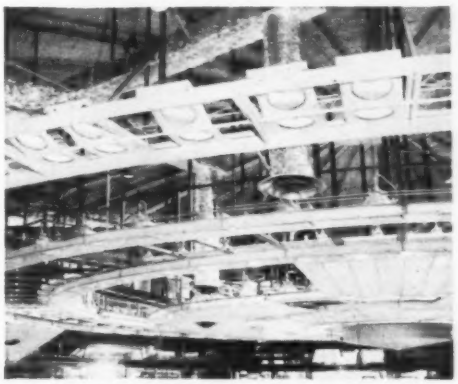
IMPRESSIVE in the Texas tradition is the new Dallas Memorial Auditorium. Its circular arena building, reportedly the largest cement domed structure in the nation, connects with a convention building and lyceum, shown on the right above.

Air handling throughout this vastness was assigned to Clarage equipment — Multitherm conditioning units, Unicoil sprayed coil units, giant system fans, ventilating sets.

Here again, as in New York's new Coliseum and other prominent buildings of all types, Clarage equipment was chosen for its recognized ability to perform quietly, economically, and dependably. CLARAGE FAN COMPANY, Kalamazoo, Mich.



One of several Clarage Type NH fans located in the outer ring which encircles the Coliseum's dome.



Arrangement of air conditioning ductwork, viewed before completion of the ceiling.

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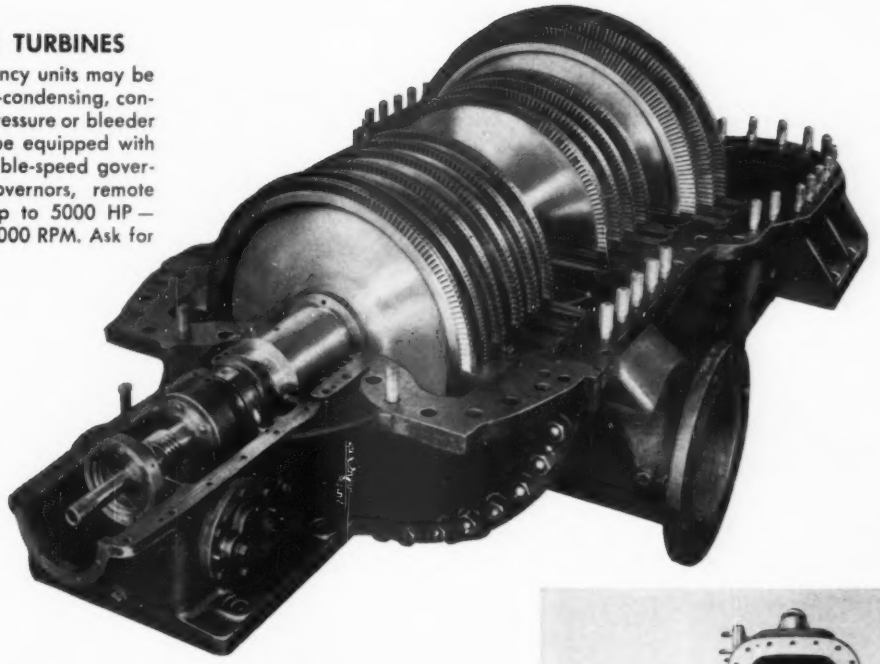

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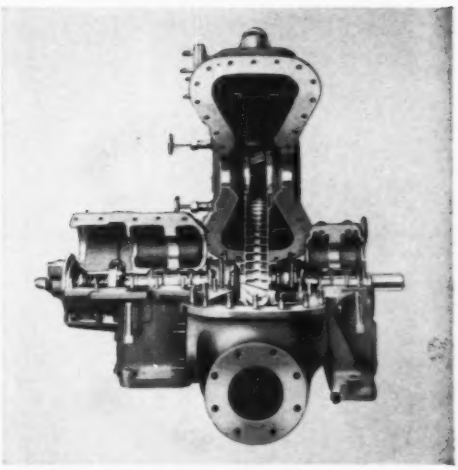

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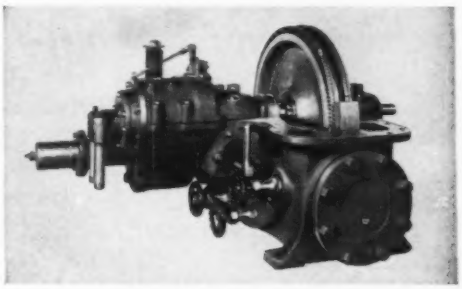

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CNE

RESUME OF ORIGINAL RESEARCH ON PUMP RADIAL LOADS AND STRESSES

Describing the cause, effect, and cure of radial thrust forces on pump impellers, bearings, wear rings, seals, stuffing boxes and the shaft itself, the booklet "MECHANICAL CONSIDERATIONS IN PUMP DESIGN" covers the basic types of process pumps, and discusses the load effects on each. Eight pages, profusely illustrated, this informative reference booklet is now available to engineers and pump buyers. For your copy, send coupon today.

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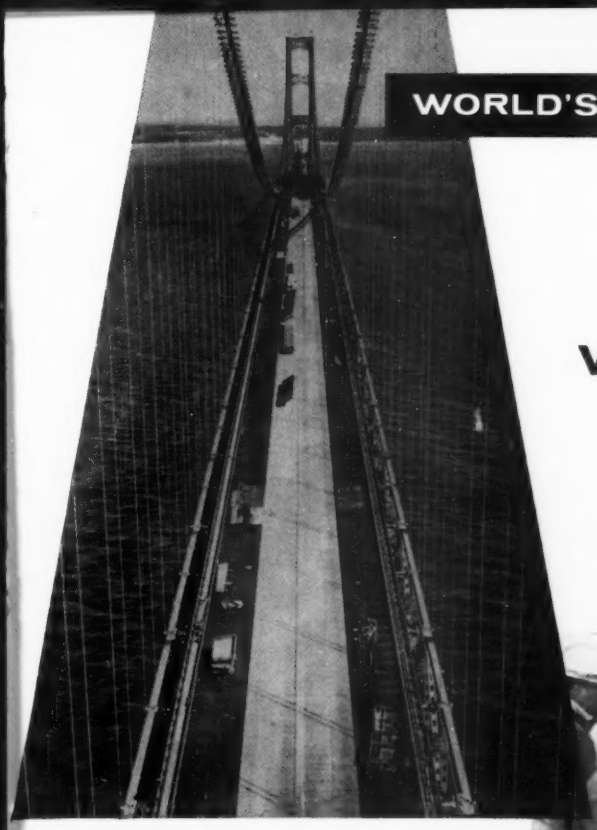
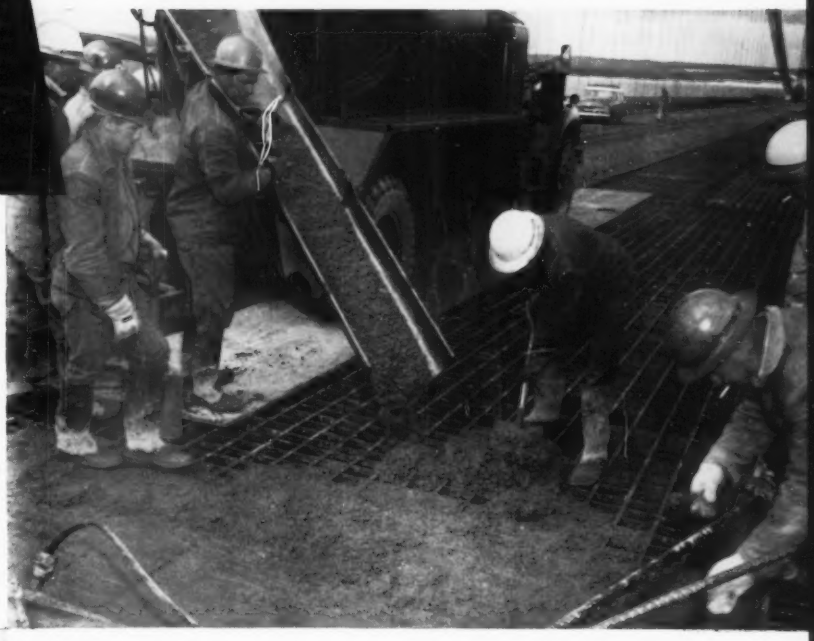


WORLD'S LONGEST SUSPENSION BRIDGE

Better Control of Lightweight Concrete Workability and Shrinkage with POZZOLITH*



Mackinac Bridge, Michigan
Owner: Mackinac Bridge Authority
Consulting Engineer: Dr. D. B. Steinman
Associate Consultant: Glenn B. Woodruff
Substructure Contractor: Merritt-Chapman & Scott Corp.
Superstructure Contractor: American Bridge Div. U. S. Steel Corp.
POZZOLITH Ready-Mixed Concrete: Louis Garavaglia Co.

Below: Determining Workability with Kelly Ball — observing penetration into fresh concrete.

Workable, lightweight concrete, with 2½"-3" slump...
Good cohesiveness and reduced shrinkage...
Strength: 4250 psi average at 28 days — 3000 psi specified...
...these are several of the benefits obtained with POZZOLITH in the lightweight concrete filled floor sections of this $100-million structure.

One of our fieldmen will be glad to demonstrate — at your desk or on the job — the important advantages of POZZOLITH for *your* projects.

*POZZOLITH — Master Builders trademark for its time-tested water-reducing, air-entraining admixture for concrete.

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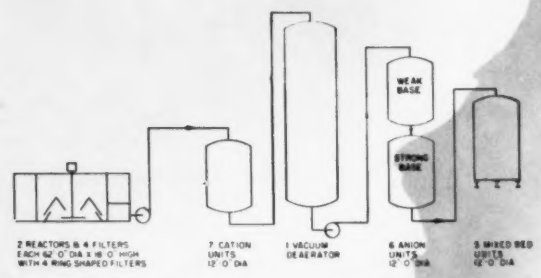
LEADERSHIP IN WATER CONDITIONING


WEAK BASE
STRONG BASE
2 REACTORS & 4 FILTERS EACH 62' 0" DIA x 18' 0" HIGH WITH 4 RING SHAPED FILTERS
7 CATION UNITS 12' 0" DIA
1 VACUUM DEAERATOR
6 ANION UNITS 12' 0" DIA
5 MIXED BED UNITS 12' 0" DIA
PRIMARY SYSTEM
DEMINERALIZER

FLOW DIAGRAM 4 BED SYSTEM WITH MIXED BED POLISHING SECONDARY UNITS — Q = 3200 GPM

LINDEN

Cochrane DEMINERALIZER

protects high pressure boilers and turbines at Linden Generating Station

WATER ANALYSIS In Parts Per Million

	Raw Water	Final Effluent	
Turbidity	3-46	0 to 0.5	Primary Treatment
Color	40-160	0 to 2	
Total Hardness as $CaCO_3$	26-164	0	Demineralizer
Alkalinity as $CaCO_3$	66-183	0 to 0.1	
Silica as SiO_2	3-12	0 to 0.01	
Dissolved Oxygen as O_2	Saturated	0 to 0.1	
Total Dissolved Solids	100-520	0 to 0.2	

TREATING PLANT

- 2—Solids-Contact Reactors, 62' dia. x 18' high, with four peripheral gravity anthracite filters. — Primary Treatment
- 7—Cation Units, 12' dia.
- 1—14' Vacuum Deaerator, rubber-lined.
- 6—Weak Base Anion Units, 12' dia.
- 6—Strong Base Anion Units, 12' dia.
- 5—Mixed-bed Polishing Units, 12' dia. — Demineralizer

Public Service Electric and Gas Company's new Linden Generating Station features the most outstanding Demineralizer Plant ever installed. The system, designed and manufactured by Cochrane, treats 30 to 100% make-up for boilers with design pressures up to 2700 psig.

Some of the unique features include complete automatic remote control for both primary treatment and Demineralizer Plant . . . Filter and demineralizer backwash recovery for re-use . . . Re-use of most anion rinse water . . . Low acid consumption . . . Silica reduction in two stages: first, by strong base primary anion units, then by mixed bed secondary units . . . Low caustic soda requirements . . . Resins cleaned by brine automatically. These and many other features assure the ultimate in efficiency for this plant.

Cochrane's years of experience in the design and manufacture of every type of water treating equipment are your assurance of continuing satisfactory performance.

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Continuous Blowoff Systems • Condensate Return Systems • Steam Specialties

Consulting Engineer

ADVERTISERS' LITERATURE

This supplement provides a current and detailed description of bulletins, catalogs, and other literature offered by advertisers in CONSULTING ENGINEER. Products and services offered are grouped into the general categories shown below. A full index is provided on the last page. Keep this supplement in your catalog file and refer to it when you need product data. Postcards are provided for ordering copies of bulletins you need.

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Bring your Technical Reference Files up to Date

Part 2 May 1958

The Consulting Engineer's Professional Magazine

AIR CLEANING AND DUST COLLECTION

1—Portable Dust Collectors

Small and medium size dust collectors, applicable to single machines or small groups of equipment producing undesirable dust, are described in four-page bulletin 162-6. Capacities range from 300 to 1350 cfm; 5000 fpm velocity in pipes, and 8 in. static pressure at the fan. These include portable and semi-portable sizes. *The Northern Blower Co.*

2—Mine Dust Control Systems

Catalog MM-4001, four pages, outlines the outstanding features of new Chem-Jet dust controlled systems for all phases of materials handling in metal and non-metallic mines. Photos show typical points of application. It also describes new Type A Hydro-Precipitator for control of gases with dust smaller than 5 microns in size. *Johnson-March Corp.*

3—Flue Dust Collector

Installation at a major public utility is shown in four-page folder, "Buell Low-Draft-Loss Flue Dust Collector," with fractional efficiency curve for full range of flue dust particle sizes. Collector is guaranteed over 90 percent efficient on particles over 40 microns, 99.5 percent efficient on particles over 100 microns. *Buell Engineering Co., Inc.*

4—Dust Control Systems

Bulletin 800 contains full technical information on industrial dust control and recovery equipment. Five types of dust filters are described in detail – four bag type collectors, one cyclone type. Complete specifications for each model within each series are included. Photos illustrate existing dust control systems. *Dracco Corporation.*

5—Air Cleaners

Catalog 76-3805 describes the operation and benefits of two-stage electronic air cleaners designed for air conditioning systems, and provides specifications for four models. It shows how to size cleaners by capacity of the system, efficiency desired and air duct sizes, and how to select the best model. *Minneapolis-Honeywell Regulator Co.*

6—Power Plant Dust Control

Six-page catalog SJP-1001 describes new Chem-Jet dust control systems for suppression of coal dust at rotary car dumpers, car shakeouts, track hoppers, conveyor transfer points, coal crushers, reclaim hoppers, and coal storage piles. It includes description of new Type A Hydro-Precipitator Scrubber for dust and fume control. *Johnson-March Corp.*

7—Electronic Air Cleaner

Supplement catalog 1460 illustrates electronic air-cleaning section with motorized washer and adhesive applicator. Capacities and dimensions are listed for 13 sizes for unitary installation or in-line assembly with air distributing units. Designed specifically for application for central plant air conditioning. *Westinghouse Electric Corp., Sturtevant Division.*

8—Air Filters

"The Amazing Story of the Absolute Filter," eight-page bulletin 106A, tells about the development of the filter for the Atomic Energy Commission and its subsequent "declassification" for use in industry where critical air cleaning problems exist. Construction, dimensions, applications, and ratings are given. *Cambridge Filter Corp.*

9—Electric Precipitators

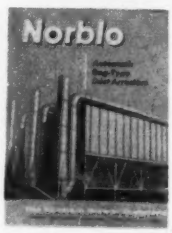
Five fundamental engineering factors governing the success of precipitator installations are fully described and illustrated in a 22-page booklet, "Buell SF Electric Precipitators." Factors include positive gas flow control, uniform electrode emission, rapping method, mechanical construction, and high voltage supply. *Buell Engineering Co.*

10—Dustkop Automatic Shakers

Bulletin 729 describes and diagrams automatic shaker attachments for single-filter Dustkop Models 520, 800, 1150, and multiple-filter models 2030, 3050. Timing device, solenoid, and motor driven hammer actions are illustrated in detail. Photographs show a shop where automatic shakers are recommended and an actual installation. *Aget Mfg. Co.*

11—National Hydro-Filter

New 6-page bulletin 58 describes National Hydro-Filter, a wet-scrubber for collecting dusts, sprays, fumes, and mists. Bulletin gives specifications, drawings, capacity charts for four models from 250 to 40,000 cfm capacity. Hydro-Filter principle is turbulent area of water, air maintained above a packed media. *National Dust Collector Corp.*



12—Automatic Dust Collectors

How the Norblo automatic bag-type dust collector can provide continuous operation at full capacity is explained in four-page folder 164-5. Dimensions and capacities are listed in tabular form. A flow diagram explains how the unit works. Each part of the collector is shown separately with a description of advantages. *The Northern Blower Co.*

13—Industrial Air Filters

"The New Cambridge Aerosolve Air Filter," four-page folder, introduces a high efficiency, low pressure drop system of air filters designed for multi-filter banks in comfort and industrial ventilation or air conditioning supply systems. Filter characteristics, advantages, operation, and application data are given. *Cambridge Filter Corp.*

14—Air Recovery Equipment

Twelve-page Dorex bulletin 108 makes available information on the use of Dorex activated carbon air recovery and air purification equipment. Included are equipment selection, application, specifications and replacement, and reactivation service. Dorex air recovery equipment is of two basic types – C Cells and Canisters. *Connor Engineering Corp.*

To order personal copies of these bulletins, please fill

AIR CONDITIONING, HEATING, AND VENTILATING

15—Evaporative Condensers

Marlo bulletin 50 describes new line of Marlo evaporative condensers, available in three types – horizontal, vertical, low silhouette; and 20 sizes, with capacities from 3 to 250 tons. The 24-page two-color bulletin includes photographs, drawings, construction features, performance charts, ratings, specifications, and other technical data. *Marlo Coil Co.*

16—School Heating and Ventilating

Consulting engineers, educators, and school boards will be interested in the new Anemostat system for heating and ventilating schools. Hot and cold outside air is brought to each classroom through two separate ducts at high velocity – one mile a minute – and diffused, without drafts, quietly throughout the room. *Anemostat Corp. of America.*

17—Quiet Propeller Fans

Bulletin 695 describes Type QD direct-drive axial flow fans for use in offices, schools, stores, restaurants, or wherever quiet operation is needed. Available in seven sizes from 12 to 36 inches. Type QD fans have certified ratings to 12,000 cfm. Bulletin describes construction features, ratings, specifications, dimensions. *Propellair Div., Robbins & Myers, Inc.*

18—Industrial Heater

Bulletin 750A is new 26-page catalog describing the construction, application, and performance features of the Herman Nelson industrial heater. It includes 13 pages of applications and arrangements, 13 performance graphs and charts pertaining to steam capacities, air flow resistance, and other air flow data. *American Air Filter Co.*

19—Air Diffusers

Bulletin K-20-A, 32 pages, describes and illustrates Kno-Draft adjustable air diffusers. Typical installations are shown, and tables, selection, and performance charts are presented for each model. Kno-Draft is the original single air stream diffuser that allows post-installation regulation of both air volume and direction. *Connor Engineering Corp.*

20—"Hy-V" Air Jets

Bulletin DH 42-56 deals with "HY-V" (high velocity) air jets which shoot cool air 74 feet without ducts with velocities up to 5780 fpm. Effective for cooling men, materials, machinery. Flexible mounting depresses 45°, swings left and right. Construction details, certified capacities, dimensions, and typical applications are listed. *DeBothezat Fans.*

21—Air Conditioning

Niagara Blower bulletin 122 describes and illustrates the operation of and suggests applications for an air-conditioning method that controls humidity to 1 percent relative humidity and temperature to 1°F (up to 140°F) with complete accuracy, entirely independent of moisture-sensitive instruments. *Niagara Blower Company.*

22—Comfort Curtain

New 8-page Lennox "Comfort-Curtain" bulletin illustrates component parts and an actual schoolroom installation of classroom heating and ventilating equipment. Dimensions, photographs, specifications, and a variety of applications are illustrated. Lennox systems have heating capacities to 120,000 Btu/hr bonnet output in gas-fired units. *Lennox Industries, Inc.*

23—Refrigeration

Bulletin TC-406, a new four-page folder, describes Thermobank compressors, factory assembled automatic re-evaporative hot gas defrost system for low temperature applications. Units are factory tested and ready to operate. Thermobank compressors feature tamper proof casing and air cooled condenser. *Kramer Trenton Company.*

24—Gas Unit Heating

Bulletin SA-571 includes comparison of gas unit heating with other types of commercial and industrial heating systems, a job appraisal check list, and tables for short-cut heat loss estimating and computing gas line requirements. Data on heater selection and installation includes discussions of controls. *Reznor Manufacturing Co.*

25—Cabinet Air Conditioner

Publication 600-1 describes Nesbitt Roommate cabinet air conditioner designed for commercial and institutional buildings. Offers a wide selection of installation arrangements. Provides cooling capacities from 1 to 5 tons and heating capacities from 25 to 100 MBH with exclusive bypass capacity control. *John J. Nesbitt, Inc.*

26—Vaneaxial Blowers

Sixteen-page bulletin A-110 gives descriptions, specifications, dimensions, and performance data on direct drive, belt driven, high temperature vaneaxial blowers in sizes from 12 to 54 in., including portable vaneaxial blowers. Blowers are listed for use against pressures as high as 7½-in. water gage. *Hartzell Propeller Fan Company.*

27—Underfeed Stoker

Bulletin 604 covers the Detroit UniStoker . . . a ram feed single retort stoker with side dump grates, synchronized automatic control of coal and air supply. Entire grate is active burning area. Unistoker is an integral unit requiring little power for operation. Size range for boilers 12,000 to 18,000 pounds steam per hour capacity. *Detroit Stoker Company.*

28—Industrial Diffuser

The Venturi-Flo diffuser provides the full range of air pattern adjustment which is essential to human comfort. A new catalog (F-7722-1) is now available which includes descriptive data, dimension drawings, and performance data, permitting the consulting engineer to determine installation requirements. *Barber-Colman Company.*

out the card between pages 4 and 5 or 36 and 37

29—Air Distributing Units

Catalog 1635-B illustrates multi-zone units for central plant air-conditioning systems. Supplies air mixtures, blended for simultaneous unequal heat load demands, in various zones requiring individual temperature and humidity control. Seven basic sizes from 4000 to 34,000 cfm. *Westinghouse Electric Corp., Sturtevant Division.*

30—Boiler-Burner Packages

Kewanee Scottie Junior Package Units bulletin 1131 illustrates and describes new oil-fired, gas-fired, and combination oil-gas Kewanee Boiler-Burner package units, 18-92 hp, high and low pressure. The booklet covers owner advantages and product features, with an abbreviated table of dimensions. *Kewanee Boiler Division, American-Standard.*

31—Light-Air Diffuser

Bulletin OD692 presents new Paraflo light-air diffuser. This recessed troffer combines high visual comfort with quiet air diffusion. Perforated metal center vee louver provides low pressure drop with lateral-spread air diffusion. Design eliminates ceiling smudge. Each Paraflo unit delivers up to 150 cfm. *Day-Brite Lighting, Inc.*

32—Cabinet Heaters

A 16-page catalog (bulletin 9617) describes the redesigned American Blower cabinet heaters. A pictorial guide shows 43 different possible mounting arrangements. Tables of steam capacities and hot water capacities are also included, together with Btu and cfm conversion tables. *American Blower Division, American Standard.*

33—Power Exhausters

Bulletin 58-A illustrates features of "Quiet-Tested" power exhausters — U-spring suspension, integral balance, high-discharge point, all-aluminum construction. Data is given for wall exhausters as well as centrifugal- and axial-type roof exhausters. Capacity tables and specifications for each type of unit are included. *Jenn-Air Products Co., Inc.*

34—Package Liquid Cooler

Bell & Gossett's colorful new bulletin (HB-258) describes all-new line of package liquid coolers. These packages are furnished complete in every detail, or parts may be purchased separately. All components, including the refrigeration compressor and compressor motor, are built by B&G. Capacities from 7½ to 150 tons. *Bell & Gossett Company.*

35—Central Air Conditioning

Fan catalog 27-6 for central air conditioning and ventilation systems contains essential data for selecting one of three basic lines. Capacity ratings are provided for class I and II fans for comfort and industrial processing air conditioning, heavy-duty class II and III units, and low pressure blowers. *Carrier Corporation.*

36—Utility Fans

Bulletin 250-A lists the complete Aerovent line of utility fans and Mancoolers for spot and area ventilating, drying, and processing. Directional 180-degree air discharge. This booklet also lists certified cfm ratings for 36 models from 16 through 48 inch fans with 2, 4, or 6 blade "Macheta" Airfoil propellers. *Aerovent Fan Co., Inc.*

37—Performance Ratings

Bulletin 153-57 describes new program enabling specifiers of air moving equipment to identify the brands of products that perform according to stated performance ratings. It illustrates typical test set-ups and performance curves for 7 centrifugal, axial, propeller fans, and power roof ventilators. *Air Moving & Conditioning Association.*

38—Packaged Chillers

A catalog on Flow-Therm packaged liquid chillers describes nine models featuring direct-drive heavy-duty compressors rated nominally from 20 through 125 tons. Catalog describes and illustrates deluxe controls, furnishes complete engineering specifications, electrical wiring diagrams, all necessary selection data, dimension drawings. *Acme Industries.*

39—Centrifugal Fans

New Chicago centrifugal fans are engineered around a backward-curved non-overload type centrifugal wheel, with a hollow-section aerodynamic shape blade. Fans meet requirements for commercial and industrial ventilating, air conditioning, and forced and induced draft heating. Blade diameters from 13½ to 168 in. *Chicago Blower Corp.*

40—Fan Ventilators

Burt wall louvers for industrial, commercial, and institutional installations are featured in eight-page bulletin SPV-17. Dimensional and construction data are given for fixed and adjustable louvers and for operators and screens. Description of each type of louver is accompanied by a cross-sectional drawing. *Burt Manufacturing Co.*

41—Coils and Baffles

New bulletin CB 276-C highlights plastic-clad aluminum construction of Kramer coils and baffles which combine the strength and flexibility of aluminum with the color and corrosion-resistance of plastics. Complete information concerning unique Kramer triple-trough baffle, coil performance, and dimensional data given. *Kramer Trenton Co.*

42—Packaged Air Conditioners

A 20-page catalog (bulletin 6125) describes the new American Blower packaged commercial air-conditioning units. Design features are detailed and illustrated, and such operating components as cooling coils, fan, fan motor, compressor, condenser, and controls are thoroughly discussed. *American Blower Division, American Standard.*

To order personal copies of these bulletins, please fill

43—Industrial Fans

Catalog PL-801 illustrates complete line of industrial high- and low-pressure fans, centrifugal ventilators, roof exhaust ventilators, utility blowers. Complete tables for selection of correct size fan, calculation of dust resistance, and installation given. Models for every industrial ventilating requirement. *Power Line Fan Co., Division Chelsea Products, Inc.*

44—Fan-Coil Air Conditioning

Catalog 39ACW-54 contains complete data for sizing two new lines of central system fan-coil air conditioning equipment. Flexibility illustrated. Select units by either entering wet bulb temperature or apparatus dewpoint methods. Ratings for chilled and hot water, steam, and fan performance also provided. 72 pages. *Carrier Corporation.*

45—Coal-Pak Boiler

Bulletin 1100 describes new line of completely automatic coal-fired water tube package boilers for steam or hot water generation. Available for low or high pressure service in capacities from 71.6 to 300 hp. Generator features unique, water-cooled pulsating grate, automatic coal feed, and ash removal. *The International Boiler Works Co.*

46—Power Roof Ventilators

Bulletin PV-1 describes "Wingjet" ventilators. These provide straight-through exhaust from ducts or open areas within the building and can be mounted on all roofs. Details, including cross-sections given for Type C (for uncontaminated air) and Type B (polluted air). Tables show capacities for 60 different sizes. *L. J. Wing Manufacturing Co.*

47—Boiler Burner Units

Webco-Ray automatic 3-pass packaged boilers for heating, power, and process steam are featured in the 1958 Webco catalog. Ratings, data, dimensions, installation details, and other specification data are given in this 8-page booklet. Capacities of these packaged units range from 25 to 600 boiler hp. *Western Boiler Co.*

48—Central Air Conditioning

Attractive 48-page bulletin 30 provides complete information on Marlo central station air conditioning units, for heating, humidifying, cooling, dehumidifying, filtering, and circulating. Ceiling or floor mounting types for horizontal or vertical air flow. The bulletin includes illustrations, construction features. *Marlo Coil Company.*

49—Steam Heating System

"Tune in with the Weather," 16-page bulletin 540, describes Selectotherm, an automatically controlled vacuum steam heating system with a single dial control to balance heat supply against heat loss. A drawing of a typical arrangement is provided, along with specifications, a selector guide, and performance data. *Illinois Engineering Co.*

50—Gas Firing

Bulletin B-8 describes the Webster Kinetic gas burner with complete information on how to select burner size, the automatic operating controls, combustion safeguards, and control valve selection. Charts and diagrams illustrate information. Use of Kinetic for conversion of heating boilers is discussed. *The Webster Engineering Co.*

51—Gas Heating Equipment

Catalog GN-57A covers a complete line of gas-fired commercial and industrial heating equipment in sizes from 25,000 to 2 million Btu. Includes suspended unit heaters — both fan and blower types — two series of floor model heaters, and two series of duct furnaces, with matched cabinet blowers. Data includes specifications. *Reznor Manufacturing Co.*

52—Packaged Engine-Compressors

Folder F-120 describes new line of Onan engine-compressors for mobile refrigeration and air-conditioning. Typical applications in trucks, sales vans illustrated. Lists three basic series: 5000 to 15,000; 10,000 to 30,000 and 15,000 to 60,000 Btu/hr capacities. Recommended selection chart, outline dimensions, and specifications. *D. W. Onan & Sons, Inc.*

53—Finned-Tube Radiation

Publication 30-1 describes Nesbitt Sillline radiation integrated with Nesbitt open and closed storage cabinets . . . a combination of the efficiency of high capacity finned-tube radiation with the convenience and attractiveness of roomy storage shelving available in six pastel colors. Eight-page catalog gives capacities, details. *John J. Nesbitt, Inc.*

54—Dual Purpose Fire Ventilators

"Fire Prevention in Industrial Buildings" explains the reason for the spreading of the disastrous General Motors fire of 1953: lack of roof openings or any form of natural ventilation; and Colt's new combination controllable ventilator that is also an automatic fusible link in fire and smoke ventilator. *Colt Ventilation of America, Inc.*

55—Turbulator Units

Air-conditioning consultants and building managers will be interested in the new line of turbulators for zone control of air-conditioned buildings. Anemostat turbulators are high-capacity 800 to 7000 cfm units with special air valves and mixing vanes built as a package, for installation in a dual-duct high-velocity system. *Anemostat Corp. of America.*

56—New Composite Catalog

Bulletin 701 is a new 12-page catalog that describes complete line of Herman Nelson heating, ventilating, and air conditioning products. Contains 17 tables and charts outlining performances, capacities, dimensions, and arrangements. New Roll-O-Vent automatic filter section's adaptation to ventilating units also shown. *American Air Filter Co.*

57—Liquid Chillers

New 16-page catalog on the Acme line of Dry-Ex liquid chillers describes various shell sizes, baffle selections, refrigerant heads, choice of materials to make available over 50,000 combinations (with capacities to 400 tons) to match requirements of virtually any system. Catalog provides selection data, engineering specifications. *Acme Industries.*

58—Ridge Type Ventilators

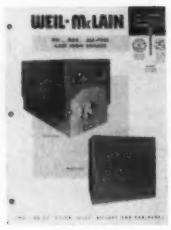
Burt continuous ridge type ventilators are described in two bulletins: SPV-6A for sizes up to 24-in. throat and SPV-6B for 30- to 96-in. throat. Design and construction, dampers, capacities, mounting, and flashing details are included. This highly efficient gravity unit has been installed in runs from one to 500 feet. *The Burt Mfg. Co.*

59—Roof Ventilator

Bulletin 600-A lists the new model 53 economy, low-level design ventilator in sizes from 12 to 72 inches for flat, slope, or peak roofs. Gives typical ratings, specifications, and dimensions for some of the more than 120 units available. This booklet also illustrates the heavy-duty model 40-A with automatic dampers. *Aerovent Fan Co., Inc.*

60—Power Roof Ventilators

Bulletin 680-C, eight pages, presents Type SB Sky-Blast power roof ventilators in capacities to 78,800 cfm and fan diameters to 60 inches. It describes and illustrates construction features, ratings, specifications, and dimensions. Drawings shown for steel, wood, and concrete base construction. *Propellair Div., Robbins & Myers, Inc.*



61—Cast Iron Boilers

Twelve-page catalog of commercial and industrial cast iron gas, oil, and all-fuel heating boilers. Net gas ratings to 3108 MBH (121.2 hp), net oil ratings to 2944 MBH (113.3 hp); ratings approved by Institute of Boiler & Radiator Manufacturers. Catalog contains ratings, dimensions, drawings, specifications. *Weil-McLain Company.*

62—Radiant Heating

"Radiant Panel Heating with Steel Pipe," 48 pages, covers the history of this type of heating, basic design, floor, ceiling, and wall panels, information on snow melting systems, pipe coil integration, design of a floor coil system, and a boiler hook-up diagram. *Committee on Steel Pipe Research, American Iron and Steel Institute.*

63—Refrigerant Condensers

Bulletin RC-25 describes compact design, exclusive features of Bell & Gossett's line of refrigerant condensers. "RCF" condensers are lighter, more compact, easier to clean, require less service, more efficient than other units. Available from 2 to 200 ton sizes. "RCF" condensers are stamped with ASME Code. *Bell & Gossett Company.*

64—High Temperature Water Heating

Basic advantages of the Type LFW Forced Recirculation Generators for high temperature water are given in ten-page bulletin 700. Chart compares capital investment, operating costs, and maintenance and repairs for high temperature water and high pressure steam for district heating from central plant. *The International Boiler Works Co.*

65—Heating and Ventilating

The Make-Up AIR, using Steelfin coil, now adds to its family a heating and ventilating unit, using Aerofin copper coil. All sections are individually supported, removable for maintenance or replacement. Nine basic blower sections are available, in any rotation. Capacities from 1500 to 30,000 cfm listed in bulletin 567. *New York Blower Co.*

66—Dry Air Filter

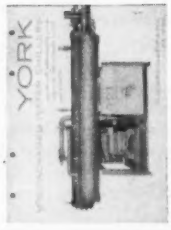
Bulletin DA-1056 provides descriptions and engineering specifications on dry-type air filters and filter silencers for application on engines, compressors, blowers, and for other industrial uses, where oil-free air and fine, efficient filtration is required. Capacities of the filters and silencers are from 20 to 6650 cfm. *The Air-Maze Corp.*

67—Remote Air Cooled Condensers

Dunham-Bush, Inc. has just printed a new catalog (7011) on the "BC" and "PFC" remote air-cooled condensers. The 32-page catalog contains capacities, dimensions, installation suggestions, and complete engineering data. Specific instructions for ordering with examples, and photos of actual installations are also included. *Dunham-Bush, Inc.*

68—High Velocity Ventilators

A new, "Penn Hi-Ex," six-page bulletin PH-44H furnishes complete information on direct and v-belt driven high velocity ventilators. Illustrated construction features show operating procedure in detail. Performance tables indicate exhaust capacities up to 40,000 cfm. Dimensional data charts are included. *Penn Ventilator Company.*



69—Water Chillers

York 36-page bulletin 30-F-21, on "Packaged Water Chillers," covers capacities, benefits, features, typical hook-ups, wiring diagrams, ratings, engineering specifications, and how to make selections. Catalog is fully illustrated and has tables for easy selection. Detail drawings and dimensions are included in the booklet. *York Corp.*

70—Ventilation Systems

This 60-page catalog describes Colt system of ventilation and wide range of equipment available. Since each building presents a different ventilation problem, each operating on the law of diminishing returns, Colt's customized chart instantly gives any engineer the cost of a variety of design solutions. *Colt Ventilation of America, Inc.*

To order personal copies of these bulletins, please fill

71—Plant Conditioners

Engineering catalog with illustrative and descriptive information and complete selection data on central plant conditioners, multizone conditioners, sprayed coil units, heating – ventilating units, cooling and heating coils. This catalog is notebook type and is index tabbed for easy and quick use. *Thermal Engineering Corp.*

72—Bonded Air Moving Equipment

Bulletin DB 45-58 deals with air-moving equipment bonded for $250,000 to guarantee that all DeBothezat products will perform according to their ratings. Specifications, descriptions, and bonded performance ratings are listed for roof ventilators, bifurcators, induced draft fans, axial-flow vent sets, and "HY-V" air jets. *DeBothezat Fans.*

73—Air Conditioners

New 32-page catalog 30-F-2, "Fan Coil Air Conditioners," is available. Catalog covers advantages, typical system, removable parts, engineering specifications, etc. Gives nomenclature, dimensions, weights, fresh air intake, mounting diagrams, and water and electrical connections for floor, wall, and ceiling units. Tables included. *York Corp.*

74—Fan Tests

Bulletin 151 tells how production unit fans are tested to determine performance characteristics for a complete series of fans of the same design and geometrically similar proportions, of the same size or larger. It also discusses basic laws of fan performance and deviations from the laws. *Air Moving & Conditioning Association.*

75—Draft Inducers

Bulletin I-57 describes draft inducers for heating boilers and power plants, ranging from small domestic and commercial heating units to those for boilers up to 120,000 lb per hr. Packaged design units are factory assembled, with air-cooled fan bearings and interchangeable inlet panels. Motor, turbine, or dual drive. *L. J. Wing Mfg. Co.*

76—Rotary Positive Blowers

Bulletin AF-154 contains descriptive information and operating data regarding rotary positive blowers of seven inches gear diameter and smaller. These blowers are rated from 1 to 10 psig and will handle from 10 to 920 cfm of air. Included in this bulletin are selection and dimension tables, performance data, drawings. *Roots-Connersville Blower.*

77—Linear Diffusers

One- and two-way blow linear diffusers are discussed in 12-page catalog No. 114. Tables are given for 3½-in., 6½-in., 7-in., and 13-in. Listed size performance data and engineering data are given. Includes list prices for linear diffusers and linear dampers. Specifications are also included in this booklet. *Tuttle and Bailey Div., Allied Thermal Corp.*

78—Door Heating System

Dunham-Bush bulletin 6013 describes new door heating system incorporating "HU" heating and ventilating units which force air to grilles above the door, then pull it back to floor grilles on both sides of the entrance. Typical installation with explicit description of unit parts and accessories is shown. *Dunham-Bush, Inc.*

79—"Scotch Type" Boilers

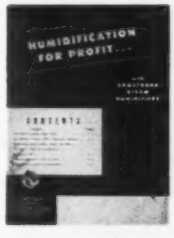
New Burnham catalog 404 furnishes design and engineering data on Burnham "Scotch Type" steel boilers. Information includes Steel Boiler Institute (SBI) ratings, certified ratings, firing rates, burner sizes and model numbers, pounds of steam per hour, lowest safe water line, and all pertinent dimensional data. *Burnham Corporation.*

80—Industrial Heaters

Bulletin illustrates exterior and interior views of Lennox heating equipment. Description of all parts, features, dimensions, and ratings of eight models ranging in output capacity from 400,000 to 2 million Btuh. Different mountings and gas fired, oil fired, or combination-fuel type burners fully described. *Lennox Industries, Inc.*

81—Centrifugal Roof Ventilators

A centrifugal roof ventilator aerodynamically designed to exhaust against high resistance and offering flexibility, space-saving, and economy is illustrated and described in bulletin 565. Capacities and dimensions are included, together with descriptions of propeller-type roof ventilators for lower resistances. *New York Blower Co.*



82—Steam Humidifiers

"Humidification for Profit," 16-page bulletin 5001, gives data showing how relative humidity affects hygroscopic materials, health, and comfort, and formation of static electricity. Schematic diagrams and sectional drawings demonstrate operation of electric- and air-operated steam humidifiers. *Armstrong Machine Works.*

83—Roof Ventilators

Bulletin PM-58 contains accurate technical information on Pullman stationary gravity roof ventilators. Sketches show ease of air flow and basic construction features. Dimensions and materials charts are furnished for convenient selection. Accessory items available are pictured and described in bulletin. *Penn Ventilator Co.*

84—Power Roof Ventilator

Bulletin 550A describes the Clarage centrilator & centrifugal type roof ventilator, the exclusive Jet Siphon. This unit combines the features contributing to quietness along with the heavy-duty features answering the higher static pressure requirements of industrial systems. Centrilator is highly efficient, has low profile. *Clarage Fan Company.*

85—Burners

This new 16-page booklet illustrates and describes Ray Burner equipment for firing oil, gas, or combination oil or gas: manual, semi-automatic, and fully automatic models; rotary, pressure atomizing, inshot gas, packaged forced draft boiler-burner units. A burner for every domestic, commercial, or industrial need. *Ray Burner Co.*

86—Exhausters

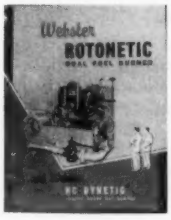
16-page catalog 100-1958 covers Ammerman's AirXpeller. Catalog is divided into four sections. Section A discusses exhausters — wall or roof mounted, direct driven; Section B, exhausters — roof mounted, power operated and belt driven; Section C, dampers — back pressure, shutters, and louvers; Section D, fans. *Ammerman Company, Inc.*

87—Roof Ventilators

Bulletin A-112, 16 pages, gives descriptions, specifications, dimensions, and performance data on the complete line of Hartzell roof ventilators, including the new reversible model, two vertical discharge models (Vertijet and Airjet), and a fan-powered rotary ventilator. Data on penthouses are included. *Hartzell Propeller Fan Company.*

88—Cleanable Cooling Coils

Bulletin R-50 describes and illustrates Aerofin type R removable-header water coils. These are cleanable-tube extended-surface coils for cooling air with water. Principal advantages are easy cleaning of tubes and positive drainage. Engineering data for various pass arrangements are given in this booklet to assist in selection. *Aerofin Corp.*



89—Dual Fuel Burners

Bulletin B-15 describes the Webster Rotonetic dual fuel unit: a low pressure forced draft gas burner and horizontal rotary cup oil burner. Pictures and charts illustrate its construction, operation, control system, dimensional specifications, and capacities. Description also includes HC Dynetic for straight gas. *The Webster Engineering Co.*

90—Electronic Air Cleaners

Bulletin EMC-1055 describes the construction and operation of Electromaze electronic air cleaners for industrial and commercial applications. Provides specifications and construction details, sizes and capacities, and gives installation requirements. Capacities to 216,000 cfm for use where ultra-high dust removal rates are required. *Air-Maze Corp.*

91—Pressure Reducing Valve

24-page catalog No. 113 covers type PRV pressure reducing valve for high and low pressure air distribution systems. Detail dimension drawings, plus complete tables and graphs on sound are included. Tables and drawings given for the acoustic duct lining. List prices are given for each size. *Tuttle and Bailey Div., Allied Thermal Corporation.*

92—Direct-Drive Blowers

Peerless Electric catalog 215 deals with AMCA-rated non-overloading Class 1 direct-drive blowers. General construction data, ratings, motor specifications, performance data, dimensions, and recommended specifications are included. Extra features and special finishes are also discussed. *Peerless Fan and Blower Division, Peerless Electric Co.*

ELECTRICAL EQUIPMENT

93—Aluminum Wires and Cables

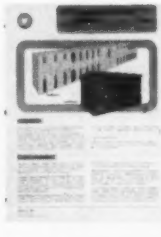
Brochure AL-2-56 deals with aluminum and ACSR overhead conductors, bare and weatherproof, for power transmission and distribution, as well as aluminum service drop cables and building wires. Engineering information is given on the comparative properties and performance of aluminum and copper conductors. *General Cable Corporation.*

94—Switchgear

Twenty four-page bulletin 7004C covers indoor and outdoor switchgear. Comprehensive drawings and charts are designed to assist you in planning. Rated 7.5 and 15 kv through 200 amps continuous and 750 mva interrupting. Bulletin shows convenient arrangements for control and auxiliary equipment. *I-T-E Circuit Breaker Co.*

95—Power Raceway

Underfloor electrical distribution catalog 857 describes and illustrates the Walker Power Raceway — an underfloor electrical distribution system for all industrial and commercial buildings. This catalog includes eight pages of dimensional drawings plus descriptions of ducts, supports, junction boxes, and numerous fittings. *Walker Brothers.*



96—Metal-Clad Switchgear

This descriptive 52-page bulletin, 32-250, covers centralized circuit control and protection for generators, motors, bus, and feeders up to 13.8 kv. A complete line of functional units available as standardized assemblies in any combination to meet specific requirements. Includes outstanding design features of this unit. *Westinghouse Electric Corporation.*

97—Plug-In Busway

New 100-ampere, plug-in Flex-A-Power busway known as the type DH and available in both three- and four-pole construction, is the subject of a new 12-page bulletin. Listed in the bulletin are features, ratings, description, dimensions, weights and guide-form specifications. *General Electric Co., Distribution Assemblies Dept.*

98—Specification Chart

Specification chart in quick-reference form provides architects and specifying engineers with full data on complete lines of specification grade wiring devices including: tap action and lever type Quiette switches; ac-dc switches, special purpose switches; standard, grounding type and polarized receptacles. *The Arrow-Hart & Hegeman Electric Co.*

99—Pushbutton Circuit Breakers

In its 40 pages, bulletin PM-385 covers all industrial, commercial, institutional, and residential panel boards manufactured by BullDog. Known as Pushmatic Electric-Centers these panelboards feature the world's only pushbutton circuit breaker – the Duo-Guard Pushmatic. Bulletin contains complete dimensions. *BullDog Electric Products Co.*

100—Fire-Proofing Tape

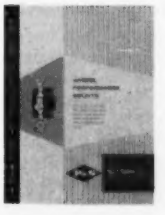
Bulletin 3080 deals with No-Ox-Id Wrap and No-Ox-Idized asbestos tape 100. Illustrations showing ease of application are only part of the informative specifications and descriptive data covering advantages and requirements. Products provide complete fire-proofing and corrosion protection with just two simple steps. *Dearborn Chemical Co.*

101—Molded Case Circuit Breakers

Comprehensive 8-page bulletin 5040A tells what ETI circuit-breakers do, and how, through their use, selective short-circuit protection may be obtained. Tables list recommended settings for five frame sizes of ETI breakers, for normal starting conditions of the majority of full-voltage, resistor, or reactor started motors. *I-T-E Circuit Breaker Co.*

102—Secondary Unit Substations

Secondary unit substations are described in detail in bulletin 18B6285C. The incoming line section, transformer section, and distribution feeder section include detail information on ratings, space requirements and design features. Application tables and guide form specifications are also included. *Power Equipment Div., Allis-Chalmers Mfg. Co.*



103—"Where Performance Counts"

A 4-page illustrated brochure featuring Pass & Seymour heavy duty switches: Super ac switches, Roto-Glo quiet ac switches that glow in the dark, T-Rated ac-dc switches. A cutaway view of a Super ac switch is presented with full data on capacity, construction, performance. The P & S testing laboratory is shown. *Pass & Seymour, Inc.*

104—Wire and Cable Data

Everything needed for the selection, design, installation, and operation of Kerite insulated wire and cable for light, power, and control service. Leatherette portfolio is tab-indexed to cover cable description, capacity, testing, technical tables, terminals, splices, and miscellaneous data of value to the consulting engineer. *The Kerite Company.*

105—High Speed Circuit Breakers

Six-page bulletin 3004-A contains descriptive and technical information about the FB line of high speed, current limiting d-c circuit breakers. Principal applications of these breakers are for generators, motors, anode protection, and as feeder breakers. Wiring diagrams and outline drawings are included. *I-T-E Circuit Breaker Co.*

106—Safety Electrification

Catalog 8-58, newly revised, describes Insul-8-Bar enclosed conductor systems for cranes, monorails, moving machinery. Contains complete engineering data, illustrated parts list, installation instructions. System capacities are 90 to 500 amperes. Standard catalog parts meet all installation and operation requirements. *Insul-8-Corp.*

107—Metal-Enclosed Switchgear

Descriptive 32-page bulletin 32-150, outlines indoor and outdoor switchgear utilizing type DB De-ion drawout air circuit breakers . . . for the control and protection of power circuits especially adapted for power centers. Such switchgear widely applied in industrial plants, electric utility stations, and commercial buildings. *Westinghouse Electric Corp.*

108—Circuit Breakers

Bulletin 3103, 8 pages, covers the Heinemann series 0911, an economical panelboard circuit breaker dimensionally interchangeable with other makes. Available in 1- and 2-pole models, 0.050 to 60 amperes, the 0911 uses hydraulic-magnetic actuation to end heat-induced nuisance tripping. Fast short circuit interruption. *Heinemann Electric Co.*

109—Fire-Alarm Systems

Bulletin FA-532 describes a complete line of fire-alarm systems for schools, hospitals, commercial, and industrial buildings. Specifications and representative wiring diagrams are included along with discussion of existing code requirements for supervised and non-supervised protection systems. The 12-page book is illustrated. *Edwards Company, Inc.*

110—Cable Fittings

"O.Z. Terminating and Splicing Fittings for Interlocked Armor Cable," 36-page engineering bulletin 135A, gives complete specifications, dimensions, cutaway drawings, photographs, and installation instructions. Prices and weights also are given for each item, along with ordering data, and available materials. *O.Z. Electrical Mfg. Co.*

111—Motor Controls

Condensed catalog No. 12 lists complete lines of magnetic relays; magnetic starters and contactors in across-the-line, reversing and 2-speed types; manual starters; push buttons and stations; housings; and other industrial controls and accessories. Listings of models with prices, electrical ratings. *The Arrow-Hart & Hegeman Electric Company.*

112—Shielded Power Cables

Flame-retardant polyethylene sheath for high voltage power cables is discussed in bulletin RCD 700. Details on Roseal – a new material for sheathing high voltage power cables exposed to especially corrosive conditions – are described. Ozone resisting insulations – oil base (Rozone) and butyl base (Rozone A) – are also discussed. *Rome Cable Corp.*

113—Dry-Type Transformers

New 8-page, slim-size bulletin, GEA-3424, gives 7 guides for selecting and installing Quiet dry-type transformers. It includes a chart on the average sound levels of typical locations and gives pointers on locating and mounting dry-type transformers. This bulletin also describes sound ratings testing methods. *General Electric Co.*

114—Weather-Protected Motors

Bulletin 05B7874C deals with weather-protected NEMA type II motors. Construction features of large horizontal motors are clearly illustrated by cross sectional drawings of bearings, ventilation paths, and internal arrangements. A clear distinction is made between NEMA types I & II motors. *Power Equipment Div., Allis-Chalmers Mfg. Co.*

115—Circuit Breakers

Bulletin 5043-A provides technical information on Cordon current-limiting circuit-breakers on low-voltage systems, operational characteristic curves, and suggested specifications. Other sections cover fault current calculation on low-voltage ac systems for the application of molded case circuit-breakers. *I-T-E Circuit Breaker Company.*

116—Dual Element Fuses

Illustrated bulletin FIS tells how 0- to 600-ampere Fusetron fuses provide all-purpose protection for entire electrical systems, including motors, coils, solenoids. Describes 10-point protection impossible with any other device. Contains opening-time charts and tables showing sizes. *Bussmann Manufacturing Division, McGraw-Edison Co.*

117—Cathodic Protection Connections

Complete new 8-page catalog, C-310M, fully describes Cadweld electrical connections for cathodic protection. Covered are connections for header leads, anode and test leads, and bonding to horizontal and vertical steel flat surfaces and pipes. Header cable taps and ground rod connections and cable connections are also listed. *Erico Products, Inc.*

118—High Voltage Insulation

Bulletin EB-27-2 deals with development and properties of butyl rubber high-voltage insulation. Explains corona formation and differences. Detailed charts and graphs show heat and ozone resistance, high-voltage properties, di-electric strength, mechanical and electrical moisture absorption, impulse breakdown. *Anaconda Wire & Cable Co.*

119—Hospital Signaling Systems

Bulletin GE-574 deals with a complete line of electrical signaling equipment for hospital use. Complete specifications are given for nurses' call systems (audio and visual), annunciators, alarm systems, registers, night lights, and accessory equipment. Sample wiring diagrams are included in the 12-page illustrated booklet. *Edwards Company, Inc.*

120—Pushbutton Guide

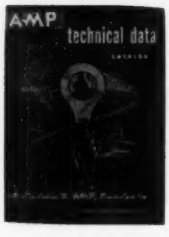
This complete guide, B-6749A, contains illustrations, application data, dimensions, prices, and circuit wiring information on a complete line of Westinghouse push-buttons. Included are Oil-tite, standard-duty, and heavy-duty pushbuttons and enclosures, as well as accessories for all units in this comprehensive 80-page booklet. *Westinghouse Electric Corp.*

121—Control Centers

Catalog SM-244, 16 pages, describes in detail the modern method for centralizing electrical power distribution and motor control equipment for industrial applications. It also contains suggested ideas for control specifications, and gives a simplified selector for use in control center layout and planning. *Square D Company.*

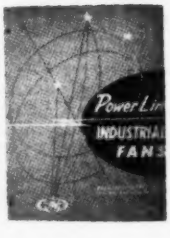
122—Distribution Transformers

Bulletin S-401B describes and illustrates the company's complete line of distribution transformers for pole type mounting as well as for substation use. Weights and dimensions are given along with a full description of the type of construction. Also available are package unit substations for outdoor installations. *Standard Transformer Company.*



123—Technical Data Catalog

78-page catalog contains complete sections on technical data, engineering and research facilities, and cost and time studies. Technical data catalog tells the story behind the AMP terminal you specify for your client's requirements. This bulletin is well illustrated and includes graphs and case studies of actual installations. *AMP Inc.*



124—Industrial Ventilating Equipment

Catalog PL-801 illustrates complete line of industrial high- and low-pressure fans, centrifugal ventilators, roof exhaust ventilators, utility blowers. Complete tables for selection of correct size fan, calculation of dust resistance, and installation given. Models for every industrial ventilating requirement. *Power Line Fan Co., Division Chelsea Products, Inc.*

To order personal copies of these bulletins, please fill

125—Dry-Type Transformers

"Engineering Data on Sound Levels of Dry-Type Transformers" compares various noises with decibel readings. It has a chart comparing decibel readings with percentage of noise reduction and gives NEMA standards of various types and sizes of transformers and the decibel rating of Sorgel dry-type transformers. *Sorgel Electric Co.*

126—Three-Phase Transformers

Bulletin 200 contains complete information about Hevi-Duty three-phase dry-type power and lighting transformers. Sizes range from 6 to 2000 kva. Illustrations, outline drawings, sound levels, capacities, prices, dimensions, weights, wiring diagrams, and temperature rise for each transformer are included in the booklet. *Hevi-Duty Electric Co.*

127—Products Guide

This 16-page bulletin contains descriptive data on major products manufactured by I-T-E, such as: power switching equipment, metal-enclosed bus, metal-clad and low voltage metal-enclosed switchgear, unit substations, air circuit breakers, network analyzers, mechanical rectifiers, and porcelain insulators. *I-T-E Circuit Breaker Company.*

128—Wire and Cable

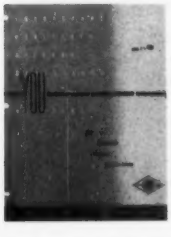
"Wire & Cable for American Industry," 72-page catalog, gives construction specifications for all types of wire and cable, such as: apparatus, appliance, audio, boiler room, building, coaxial, control, gasoline resistant, instrument, mining, power, railway signal, remote control, street lighting, and many other types. *Continental Wire Corp.*

129—QMR Panelboard

A new heavy-duty fusible power panelboard type QMR, is the subject of a new four-page bulletin. The new panelboard is designed for maximum 600-volt a-c service, two- or three-wire single-phase and three- or four-wire, three-phase applications. Complete ratings and dimensions are listed. *General Electric Co., Distribution Assemblies Dept.*

130—Electrical Fittings

Loose-leaf catalog 135 has been prepared to provide all the technical information you need to select the right conduit fittings, cable terminators, cast iron boxes, and solderless connectors for each of your electrical installations. It includes a comprehensive index and a section of useful engineering data. *O.Z. Electrical Mfg. Co.*



131—Branch Circuit Protection

"What You Should Know About Circuit Breakers for Branch Circuit Protection," 16-page manual 101, describes ways of protecting your client from fire, equipment damage, excessive wiring costs, and needless circuit interruptions. How hydraulic-magnetic circuit breakers provide this protection is pointed out. *Heinemann Electric Co.*

132—Cartridge-Type Terminals

AMP's entirely new termination method for aluminum wire is contained in new 24-page catalog. New "cartridge-type" terminals inhibit oxidation, provide insulation support, reduce effects of cold flow, control heat rise, and assure even current distribution to all wire strands by symmetrical confined crimp design. *AMP, Inc.*

133—Underfloor Electrical Systems

Catalog 354-I describes Walker Underfloor Electrical Distribution Systems for concrete floors, "Cofar" floor construction, steel deck floors, wood floors, and floors with radiant heating. The catalog includes a section on service fittings to meet various requirements, including high and low tension service. *Walker Brothers.*

134—Disconnectors

Bulletin 140, 36 pages, describes 3E Isolators for disconnecting equipment and cables, in ratings up to 15,000 v and 1200 amp. It lists points to be considered when ordering, shows the units in typical applications, and gives dimensional drawings, cutaways, and specifications for the various types of equipment. *Electrical Engineers Equipment Co.*

135—Electric Supply Equipment

Publication 224 describes Flexlab equipment for high school electric shops. Illustrations and specifications are included on switchboards, power supplies, enclosures, service outlets, motor-generator sets, dynamometers, storage batteries. Also includes information on electric shop requirements, a typical shop layout. *The Standard Electric Time Co.*

136—Semi-Conductor Rectifier

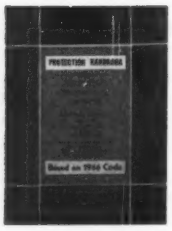
Four-page bulletin, 12B8897, discusses germanium rectifiers and includes brief information about silicon and selenium types. Construction features of the germanium unit are shown, with alternate cooling systems. A chart shows approximate dc current and voltage ratings for petrochemical service. *Industrial Equipment Div., Allis-Chalmers Mfg. Co.*

137—Aluminum Conductor Bus Duct

New bulletin AB-760 gives complete engineering and dimensional data on BullDog BUStribution duct systems with aluminum conductors. In addition, this 52 page catalog covers the phenomenal growth in the use of aluminum as conductor material in bus duct systems. This book covers BullDog LO-X (feeder) bus duct. *BullDog Electric Products Co.*

138—Electric Connections

Completely new 104-page electrical connection catalog covers exothermic method of welding copper to copper or steel without an outside source of heat. All types of connections for cable, ground rod, cable to steel surface, cable to bus bar and tube, bus bar single or multiple, tubular bus bar, and studs are illustrated. *Erico Products, Inc.*



139—Electrical Protection Handbook

Easy-to-read interpretation of National Electrical Code (1956) on motor protection. Illustrated booklet tells how to select correct protective devices for electrical circuits, motors, and apparatus. Contains volt loss tables; motor tables showing proper fuse to use; wiring diagrams. *Bussmann Manufacturing Division, McGraw-Edison Co.*

140—"Four Minute Tour"

"The Four Minute Tour" is a word and picture trip through the facilities and offices of Continental Wire. It points out some of the machines and operations used to make insulated wire and cable: taping heads, extruder, winder, braiding machinery, carders, varnishing towers, and types of inspection at each point. *Continental Wire Corp.*

141—Synchronous Generators

High-speed synchronous generators, 30 to 300 kw, for standby and continuous applications, are described in bulletin 51B8909. Single-bearing, close-coupled units are available for direct connection to internal combustion engines; two-bearing units also available for belt drives or direct connection. *General Products Division, Allis-Chalmers Mfg. Co.*

142—Mineral Insulated Cable

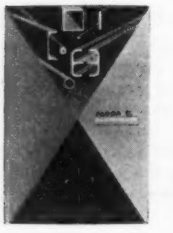
Brochure S-2-54 deals with an unusual self-contained wiring system known as MI. The brochure outlines method of fabrication and suggests installation procedure. Construction and performance characteristics as well as electrical and mechanical properties are given, and some 600 v applications graphically shown. *General Cable Corporation.*

143—Specification Manual

New 20-page manual gives comprehensive specification data on Square D electrical equipment — safety switches, panelboards, switchboards, dimmerboards, control centers, bus duct, and substations. The manual also includes convenient reference guide to National Electric Code requirements, of benefit to all consulting engineers. *Square D Company.*

144—Air Interrupter

Bulletin 152 lists and illustrates a complete line of dry-type and liquid-filled switches through 14.4 kv. Units offer Auto-Speed interruption and automatically produced interruption that occur at the same point in the switching operation and take ½ cycle. Ratings, dimensions, and specifications are given. *Electrical Engineers Equipment Co.*



145—Bus Conductor Handbook

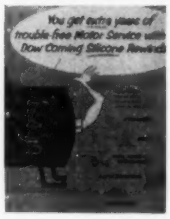
280-page handbook presents facts and figures vital to anyone responsible for engineering of bus installations. Contains 69 graphs, tables, and photographs, presenting essential information in easy-to-read, readily usable form. Shapes, design, reactance, capacities, deflections, joints, and installation are covered. *Aluminum Company of America.*

146—Low Voltage Switchgear

20-page, two-color bulletin, No. 6004-C, provides a complete review of the company's new low-voltage power circuit breakers and switchboards, ranging in unit ratings from 225 to 4000 amperes. Advanced features of the new K-Line breakers, whose ratings are 225, 600 and 1600 amperes are described. *I-T-E Circuit Breaker Co.*

147—Distribution Centers

New 16-page illustrated bulletin, GEA-6619, gives complete details on General Electric's new dry-type integral distribution centers, tells how one-piece construction saves space, simplifies specifying, ordering, and installation. Model numbers, dimensions, and choice of incoming line components are given. *General Electric Co.*



148—Silicone Insulated Motors

Case histories describing how increased reliability and greater overload capacity were achieved by applying silicone insulated motors are detailed in six-page brochure 10-104. Applications ranging from small integral horsepower motors on processing lines through large power plant auxiliary drives are evaluated. *Dow Corning Corp.*

149—Single Phase Transformers

Bulletin 100A contains, in table form, complete statistical information on Hevi-Duty single phase, dry type, insulating transformers, .050 to 500 kva, for power and lighting circuits. Photographs, dimension drawings, capacities, prices, temperature rise, weights and dimensions are given for each transformer listed. *Hevi-Duty Electric Co.*

150—Wiring Devices

Catalog 60 features 75 illustrated pages describing a complete range of electrical wiring devices in both the interchangeable Despard line and the P&S conventional line. Everything from switches to fixtures — devices for every conceivable purpose — are listed. A 15-page index and price list is also included in this catalog. *Pass & Seymour, Inc.*

151—Control Cables

Booklet DM-5704 is complete manual on Anaconda control cable. It shows typical installations, points out trends in automatic control, offers a guide for every control cable application, and provides complete property and construction information on Anaconda rubber and thermoplastic control cable. *Anaconda Wire & Cable Co.*

152—Interrupter Switches

Bulletin 1610A, 24 pages, describes and illustrates arc-chute type interrupter switches, fused and unfused, for switching feeder circuits. Usually metal enclosed, the switch can be wall mounted, free standing, or grouped with common bus. Switches can close in on moderate faults. *R & IE Equipment Div., I-T-E Circuit Breaker Co.*

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153—High Voltage Power Cables

Technical bulletin RCD 701 describes tough, weather-resistant neoprene (polychloropene) sheathed high-voltage power cables for 3 to 15 kv service. The company's ozone resisting insulations—oil base (Rozone) and butyl base (Rozone A)—are discussed in detail. Complete technical data is given in this 4-page bulletin. *Rome Cable Corporation.*

154—Dry Type Transformers

Bulletin S-202B describes and illustrates the company's complete line of dry type transformers for indoor and outdoor use. Sizes through 15 kva are available in compound filled cases for use in hazardous areas. The company also produces complete package type unit substations. *Standard Transformer Company.*

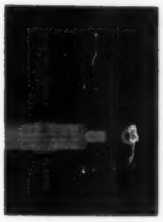
155—Bus Duct Manual

Booklet B-4272C is designed for consultants' use in planning and selection of units for bus duct layout in commercial, institutional, and industrial buildings. Plug-in duct, outdoor feeder duct, low-impedance duct, and Life-Line Busway are fully covered. Completely illustrated with engineering and test data. Eighty pages. *Westinghouse Electric Corp.*

156—Circuit Breakers

Bulletin 1604-A. Fully illustrated bulletin covering new K-Line low-voltage power circuit breakers. Breaker is spring operated for quick make manual or electrical operation. Ratings are 15 through 1600 amperes continuous; 15,000 to 75,000 amperes interrupting. Circuit breakers available for 600-v ac and 250-v dc. *I-T-E Circuit Breaker Co.*

HEAT EXCHANGERS AND WATER HEATERS



157—Heat Transfer Equipment

New Ross brochure presents diverse heat transfer lines and expanded facilities, demonstrating Ross ability to handle any size or type job. Describes recently opened plant devoted completely to surface condensers and specially engineered exchangers, plus original plant where smaller units are produced. *Ross Heat Exchanger Division, American-Standard.*

158—Hot Water Heaters

Bulletin Type J Covers the complete line of Sims instantaneous water heaters, which have capacities to 70,000 gph in temperature ranges from 40 to 80°F, 40 to 100°F, 40 to 140°F, 40 to 180°F, and 40 to 200°F at selected pressures. Includes prices, weights, capacities and dimensions for all Type J water heaters. *The Sims Company.*

159—Feedwater Heaters

Feedwater Heaters, for Central Stations and Industrial Power Plants, is title of 16-page catalog by Alco. Catalog gives description of Alco high pressure closure and tells how improved heaters give you greater value. Catalog completely illustrated. Includes cutaway detail drawings. Gives dependable, efficient, and economical service. *Alco Products, Inc.*

160—Heat Exchangers

Bulletin 132 describes the new panel casing construction method that makes the Aero heat exchanger fully accessible for cleaning and saves your client expense in shipping and installation. This is a self-contained cooling system for water, oils, and solutions that replaces the cooler and the cooling tower. *Niagara Blower Co.*

161—Heat Exchanger Catalog

A completely revised heat exchanger catalog has just been published. The catalog contains an engineering section that provides the engineer with the means to make size estimates of the heat transfer equipment to be used in his clients' plants. Simplified friction factor charts included. *Condenser Service & Engineering Co., Inc.*

162—Heat Transfer Manual

This technical data manual defines and describes Tranter's four different Platecoil styles, employing graphic dimensions. Features and applications are also discussed and typical layouts are pictured. Calculations and charts computing pertinent temperature information are given as are tables concerning sizes and capacities. *Tranter Mfg., Inc.*

163—Convertor Rating Tables

Bulletin 62, 16 pages, has been designed in answer to the need for convertor rating tables that are accurate and arranged for rapid and easy reading. At least three Type R U-tube convertor sizes are listed for each set of operating conditions, depending on pressure drop limitations. Booklet is indexed for quick reference. *Whitlock Mfg. Co.*

164—Smooth-Fin Heat Exchangers

Bulletin S-55 describes new smooth-fin heat-transfer coil construction that permits closer fin spacing, greater capacity per sq ft of face area, and use of higher air velocities without turbulence or excessive friction. It also illustrates many types of extended-surface heat exchangers for heating, cooling, and processing. *Aerofin Corp.*

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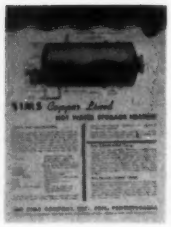
165—Storage Heaters

Bulletin 40B, 16 pages, has been written to facilitate selection of type K storage heaters for conditions normally found in buildings of various classifications. Typical layouts are included along with tables of pressure thickness, vertical and horizontal storage heater dimensions, and capacities. *The Whitlock Manufacturing Co.*



166—Storage Water Heaters

Type BH hot-water storage heaters and U-tube heating elements, including capacity, dimensions, pressures, weights and list prices. A condensed 5-page booklet gives only the essential data needed to specify these units for institutional and service applications. Data included for copper, Corro-Shield, and hydraulic cement linings. *The Sims Co.*

HIGHWAYS, BRIDGES, AND STREETS

167—Bridge Specifications

This publication contains the information required for the selection and preparation of specifications for wire, strand, and rope used on guyed structures and suspended systems of all kinds, except major suspension bridges. Both standard and special fittings for use with bridge strand and bridge rope are illustrated. *John A. Roebling's Sons Corp.*

172—Corrugated Bridge Planking

Armco manual BP-8455 deals with corrugated metal bridge planking for new or existing bridges and grade separation structures. Engineering details, dimensions, and design data given; also recommended installation practices. The bulletin includes tables on maximum stringer-to-stringer spans. *Armco Drainage & Metal Products, Inc.*

168—Bridge Decking

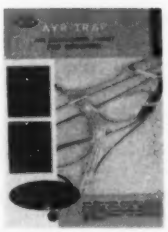
Irving decking catalog F-300 contains illustrations, descriptions, and engineering data on open metal grid bridge roadways, with many of the advantages inherent in this type of bridge roadway, such as light weight, cleanliness, drainage, safety, durability, strength, traction, and economy. *Irving Subway Grating Company, Inc.*

173—Prestressed Concrete Wire

This comprehensive manual deals with Tufwire stress relieved wire and strand for prestressed concrete. It features widening application of both pre-tensioning and post-tensioning, and includes engineering data on methods of determining elongation values together with typical elongation curves and tables. *Union Wire Rope Corp.*

169—Asphalt Curbs and Gutters

New bulletin contains full Asphalt Institute specifications for mixing and placing these low-cost high-performance curbs, which are now readily available in a wide variety of graceful forms. An added feature is the appendix which contains the FHA-approved specification. Price: 20 cents from the Asphalt Institute. *The Asphalt Institute.*



174—Concrete Air-Entraining Agent

Ayr-Trap 4-page catalog shows a complete line of air-entraining agents for concrete which meet major federal, military, and state highway specifications. Detailed information together with product application techniques are explained. Ayr-Trap gives concrete better working qualities, improved plasticity. *Sun Chemical Corp., A. C. Horn Company.*

170—Highway Railings

One of the most complete catalogs on this subject. Contains: specifications, design data, details for 47 sizes and types of cast posts, dimensions and properties of rails and other components. A valuable handbook for the consulting engineer engaged in the design of highway railings. Forty pages. *Michael Flynn Manufacturing Co.*

175—Bridge Flooring

This 32-page booklet contains complete descriptions, specifications, drawings, and design data covering all types of Am-Bridge I-Beam-Lok. Also included are details of flooring applications plus a brief discussion showing how Composite Tee-Beam Action can be used with I-Beam-Lok. *American Bridge Div., United States Steel Corp.*

171—Concrete Curing Compounds

Horncure 4-page catalog shows complete line of clear and white pigmented concrete-curing compounds which meet major federal, military, and state highway specifications. Detailed information together with product application techniques are explained. Horncure reduces tendency of concrete to scale. *Sun Chemical Corp., A. C. Horn Company.*

176—Prestressing Concrete

Two of the most common methods of computing elongation are outlined. One is based upon tensioning 70 percent of ultimate strength; the other upon application of pounds per initial load. A typical load elongation curve on ⅜- and 7/16-in. strand is included as well as tables and charts on physical properties. *Union Wire Rope Corp.*

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177—Heating and Cooling Controls

Catalog 858 (60 pages) is entitled Mercoid Automatic Controls for pressure, two-stage pressure, differential pressure, temperature, two-stage temperature, liquid level, float, lever arm, mechanical movement, also hermetically sealed mercury switches and transformer-relays. Book is illustrated, provides ordering information. *The Mercoid Corp.*

178—Automatic Controls

The new 16-page application manual UVCA gives details on automatic controls for hot water, steam, gas-fired, electric, and combination hot- and chilled-water unit ventilators. Each application describes complete cycle of operation, the correct system of electronic control, and a complete list of specifications. *Barber-Colman Company.*

179—Electronic Computer

Electronic Computer Specifications manual S-526 gives the operation times, physical description and components used in the Royal Precision Computer, a desk-size mobile electronic computer. The Royal LGP-30 is a serial single-address fixed-point binary stored-program digital computer. *Royal McBee Corporation.*

180—Time Recording Systems

"First Quality for Timing Accuracy" contains general description of electronic, synchronous wired, and Autoset impulse time and program systems with illustrations of the master time control, secondary clocks, and signals. Also illustrated and described briefly are attendance time recorders, job cost recorders, time stamps. *Stromberg Time Corp.*

181—Automatic Weighing System

"Weight . . . Its Measurement and Control," 20-page catalog 12, compares batch-in, batch-out, and continuous weighing processes, and explains how a completely automatic weighing system can be assembled by building block techniques using W & C's Uni-Force weighing components. *Weighing and Control Components, Inc.*

182—Contactors, Switches, Relays

ASCO catalog 57-S3 provides complete information on normally open, normally closed, and double-throw ac and dc contactors. Electric heater panels, feeder control switches, street lighting relays, and special magnetic contactor panels are also described. The catalog consists of 106 pages. *Automatic Switch Company.*

183—Liquid Flow Recorders

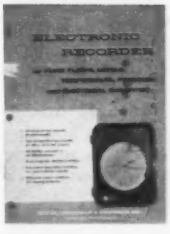
The sixth edition of bulletin 25 describes new models of Stevens type B series recorders for graphic recording, totalizing, and indicating liquid flow. Both direct float-operated and remotely controlled instruments are described in the 6-page bulletin. The instruments are particularly adapted to waterworks. *Leupold and Stevens Instruments, Inc.*

184—Density Tester

Bulletin CN-980 contains complete information on the new Volumeasure, a self-contained, lightweight, and accurate unit designed for fast and simple field or laboratory in-place density tests of soils. The unit provides a positive test method for use in embankment control and also for subgrade compaction projects. *Soiltest, Inc.*

185—Liquid Level Controls

Catalog Section VI gives complete specifications, ratings, and dimensions of Magnetrol's line of external float gage liquid level controls for higher pressures and temperatures: standard units for pressures to 5000 psi and special units for higher pressures. Equipped with mercury or Microswitches, or pneumatic pilot. *Magnetrol, Inc.*



186—Electronic Recorder

Bulletin MSP 149 describes the Hagan electronic recorder for recording fluid flows, liquid levels, temperature, pressure, and electrical quantities. The recorder handles as many as four records simultaneously and has interchangeable input boxes. The recorder can be specified as ac bridge or dc potentiometer. *Hagan Chemicals & Controls, Inc.*

187—Photo Control System

Bulletin 76-3311 describes the operation of photo control system for the control of inside space illumination. Two-position control and multi-stage control. Other points discussed include speed of response, location of photo tube, installation, calibration, and typical performance of the whole system. *Minneapolis-Honeywell Regulator Co.*

188—Industrial Tank Gages

Bulletin 6004 describes a new line of remote reading industrial liquid depth gages. It presents comprehensive information on operation and design of the Petrometer series 1400 gages, as well as on the method of selecting the right gage for remote indication of depth or quantity of liquids in tanks and pressure vessels. *Petrometer Corp.*

189—Liquid Level Alarms

A series of four Levalarms, liquid level alarms and fuel cut-outs, is described in four-page bulletin D2. The bulletin explains principle of operation – water conduction between electrodes of varying lengths – how the units can be used with relays to provide alarm actuation, fuel cut-out, or pump start-stop control. *The Reliance Gauge Column Co.*

190—Industrial Gages

16-page catalog 305 introduces the entirely new USG "A"-Line of general purpose industrial gages, which conform to or exceed ASA Grade A standards. Various designs and sizes, for use in air, oil, steam, refrigerants, hydraulic or ammonia systems, compressors, diesel engines, etc. *U. S. Gauge Div., American Machine & Metals, Inc.*

191—Clocks and Signals

New architects' and engineers' catalog contains general descriptions, illustrations, specifications, and complete details on time and program systems (electronic, synchronous wired, Autoset impulse); clocks (secondary, synchronous, wall, double-faced, tower, special designs); signal equipment. *Stromberg Time Corporation.*

192—Desk-Size Computer

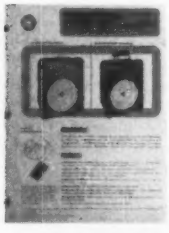
Illustrated brochure S-525 describes the LGP-30 computer, a desk-size electronic computer ideally suited for engineering calculations. Its simplicity, low cost, and mobility make it a significant saver of engineering time. The LGP-30 computer may be programmed to solve a wide variety of complex problems. *Royal McBee Corporation.*

193—Remote Reading Gages

"You can check the liquid level from anywhere in the room," eight-page bulletin 246, covers the three standard types of convex scale and flat scale truscale remoted reading gages, showing how they afford protection for valuable equipment and thus prevent expensive and time consuming shutdowns. *Jerguson Gage & Valve Co.*

194—Thermostatic Controls

Bulletin 362 describes Powers type N-45 and N-125 Hydroguard for thermostatic control of water temperature for schools, industry, hospitals. Hydroguard available to 165 gpm capacity at 75 psi pressure, feature liquid filled thermostatic motors with "fail safe" provisions, balanced valves, built-in strainer-checkstops. *The Powers Regulator Company.*



195—Recording Instruments

Eight-page catalog section 43-450 includes type 45 recorder applications, design features, specifications, circuit diagrams, special features, list prices, and ordering information . . . suitable for switchboard, portable, or pole mounting. Features weatherproof construction and accuracy within 2 percent. *Westinghouse Electric Corporation.*

196—Compression Tester

Bulletin AP-350 illustrates and describes the Versa-Tester, a multi-purpose compression testing machine ideal for research or routine laboratory testing. Accurate tests requiring capacities to 30,000 lb can be performed simply and quickly on soils, bituminous materials, mortar, concrete, plastics, metals, and wood. *Soiltest, Inc.*

197—Columns and Gages

Water columns, gages, and equipment for pressures from 250 to 2500 psi are each briefly described in four-page catalog 500, Sec. BO. Cutaway views explain operation, construction, and advantages of each item. Equipment is also shown for replacement and modernization of existing boiler installations. *The Reliance Gauge Column Co.*

198—Tank Contents Gaging

Suggested specifications for tank contents gaging systems – hydraulic, hydrostatic, and direct reading – are given in bulletin 463A. Model selection guides and pictorial diagrams are included, along with a list of liquids successfully gaged by Liquidometer systems, and principles of operation of each gage. *The Liquidometer Corporation.*

199—Valve Controls

"Limitorque Control," 30-page catalog L-550, gives background information on this automatic, power activated device for controlling all types of valves and sluice gates. It describes the available types and lists specific applications. Installations are shown in power plants, refineries, and in various industries. *Philadelphia Gear Works, Inc.*

200—Dewpoint Indicators

Bulletin DPI-4 covers dewpoint indicator which determines water vapor content in gases by measuring dewpoint temperature. A primary measurement instrument, indicator gives accurate readings from ambient to −100F. Portable battery-operated unit can check moisture content of dried air or gases. *Weighing & Control Components, Inc.*

201—Flow Controls

10-page booklet, "The Power Plant of Tomorrow," describes the use of Magnetrol liquid level and flow controls at the experimental boiling water reactor, Argonne National Laboratories. Actual photographs from inside the reactor, and a simplified flow diagram explain complete function of the 16 Magnetrols installed. *Magnetrol, Inc.*

202—Flow Indicators

Bowser flow indicating devices for many industrial in-plant or process systems are illustrated in a broad size range with complete data, including specifications and dimensions for easy reference. Each product is pictured and described with suggested commercial and industrial applications, sizes, and various types listed. *Bowser, Inc.*

203—Pneumatic Instruments

Catalog 510, 16 pages, on pneumatic instruments for process control, discusses indicating pilots, transmitters, and receiver gages. The new 3½ in. Scanning Diaphragm Receiving Gage with rotatable dial is described and illustrated. Ordering data, dimensions, and typical dial faces are given. *U. S. Gauge, Div. of American Machine and Metals, Inc.*

204—Automatic Regulators

4-page condensed catalog outlines the range of Foster automatic regulators for the control of pressure, temperature, liquid level, and flow; also flow tubes, an impact-type head meter designed for accurate measurement and regulation of fluid flow. Catalog contains nine complete tables of specifications. *Foster Engineering Co.*

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205—Magnetic Gage

Data Unit No. 306 describes and illustrates the new Jerguson magnetic gage which is designed for gaging liquids under conditions where glass, gaskets, and threads cannot be used due to the high potential danger of explosion or fire if the slightest trace of gas escapes. Dimensions and specifications are given. *Jerguson Gage & Valve Co.*

206—Industrial Wired Television

Bulletin 2140 describes Model 500 closed circuit television camera system . . . compact and complete for industrial use. Camera is self adjusting to compensate for wide variations in scene brightness. Weatherproof housings available for outdoor use. Picture viewed on UtiliVue monitor or TV receiver. *Diamond Power Specialty Corp.*

207—Flow Tubes

The Gentile Flow Tube, now in use for metering water, air, steam, oil, jet fuel, hydrocarbon liquid, clay, slurry, raw sewage, brine, methanol vapors, black liquor, casing head gas, coke oven gas, argon, helium, sludge, white water, and paper stock is described in six-page bulletin FT. Sizes start at ⅜ in. I.P.S. *Foster Engineering Co.*

208—Aerodynamic Testing Controls

New 18-page bulletin MSP 133 describes Hagan high-speed automatic controls for aerodynamic research and testing facilities. The Hagan "Powr-Amp" series of precision electric and electronic components are included with descriptions of function and operating method of each device, specifications. *Hagan Chemicals & Controls, Inc.*

INSULATION

209—Pipe Insulation

Brochure J-531 describes new B-H 101 pipe insulation. Designed for lower cost installation of steam-traced lines and pipes up to 30 in. Felted mineral wool pipe insulation faced with 2 x 2⅝ in. 16 ga. galvanized welded wire fabric. Fast fastening – thread lead wires under stay wires, then bend. Data and specifications included. *Baldwin-Hill Company.*

210—Underground Pipe Insulations

Four-page illustrated brochure discusses the problems of underground pipe insulation and explains how Gilsulate's special properties overcome them. On-the-job photos illustrate ease and speed of application. Thermal coefficients of transmission and other technical data and specifications are given. *American Gilsonite Co.*

211—Snap-On Pipe Insulation

Brochure SO357 deals with Snap-On one-piece molded pipe insulation of fine glass fibers. Comparative thermal conductivity tables, recommended thickness, heat loss, and efficiency data tables are included, as well as sample specifications for hot or cold piping and application instructions. *Gustin-Bacon Manufacturing Company.*

212—Industrial Insulations Catalog

Just published, this 20-page catalog contains a temperature guide for insulation selection and data on Baldwin-Hill's complete line of industrial insulations and accessories. Thermal conductivities, graphs, recommended thicknesses, product sizes, and uses are given for each of 17 types of insulation. *Baldwin-Hill Company.*

213—Ultralite Insulation

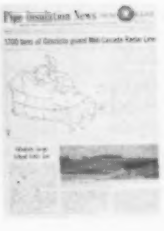
Brochure ULG857 offers many suggestions for thermal and acoustical applications of Ultralite long glass fiber insulation. Physical, thermal, and acoustical properties are explained and its applicability to metal buildings, storage tanks, hot and cold piping, transportation equipment is discussed. *Gustin-Bacon Manufacturing Company.*

214—Silicone Products

Over 50 silicone products, including electrical insulation, are described in new 16-page brochure 1-113. Included are high temperature paints and masonry water repellents; silicone lubricants for extremely high and low temperatures. Advantages of specifying silicone insulated motors and transformers shown. *Dow Corning Corp.*

215—Lagging Adhesives

Swift's lagging adhesives for heating and process piping, and the 12 important advantages that they offer, are described in four-page folder 9283. They are recommended for bonding shells of molded insulation to themselves or pipes; as binder for loose insulation; and to adhere and size lagging cloth. *Swift & Co., Adhesive Products Dept.*



216—Pipe Insulation

Pipe Insulation News. News magazine, published quarterly by the manufacturer of Gilsulate insulation for underground hot pipes, carries stories and articles dealing with problems of insulating these pipes. This issue (fourth) tells of obstacles overcome in building of the Mid-Canada Radar Line and the role played by Gilsulate. *American Gilsonite Co.*

LIGHTING

217—Commercial Fixtures Catalog

The Moe Light lighting fixture catalog for commercial use includes interior and exterior decorative and utilitarian fixtures. This catalog heralds Moe Light's entry into the high-style commercial lighting field and is the most unique lighting manual of its type offered to the creative professional. *Thomas Industries Inc., Moe Light Div.*

218—Fluorescent Fixture

A new eight-page folder describes the new Guthlite Jr. fluorescent Luminaire for commercial and institutional applications. Brochure includes fixture photographs, light curves, coefficients of utilization, full descriptive and engineering data, plus various shielding and diffusing bottoms available on Guthlite Jr. installations. *The Edwin F. Guth Co.*

219—Lightguard Emergency Lighting

Bulletin 5926 describes new emergency lighting units with fully automatic battery charge control. Contains charts showing operational reliability, beam coverage, light intensity, and protection time. Describes units designed for mounting on posts, walls, or shelves. *Exide Industrial Division, The Electric Storage Battery Company.*

220—Lighting Fixtures

New eight-page folder shows Sylvania's complete line of industrial and commercial fixtures as well as two systems of wall-to-wall lighting. Illustrations and general copy shows the wide choice available from this complete fixture line. Factual descriptive copy tells of different models available in each fixture family. *Sylvania Electric Products, Inc.*

221—Lighting Pocket Catalog

Complete pocket-size catalog shows over 5000 different lighting units and accessories – sections on commercial fluorescent, industrial fluorescent, industrial incandescent, mercury-vapor, floodlights, protected incandescent. Designed for the man who needs a lighting reference book at his fingertips. *Benjamin Electric Manufacturing Company.*

222—Surface-Mounted Lighting

Circulite brochure describes a new fully enclosed light form that utilizes two Circline lamps – one 12 in. diameter 32 w and one 16-in. diameter 40 w. Cross-section drawings detail the regressed housing and the frameless self-supporting diffuser. Full product information is given for both sizes – 24 in. square and 24 in. diameter round. *Lightolier, Inc.*

223—Ballast Sound Rating

"A General Electric Report on Ballast Sound," GED-3164, gives an inside story on General Electric's ballast sound rating system. This new eight-page bulletin tells the reasons why it's just as important to specify the sound level as well as the light level of fluorescent lamp installations for a satisfactory result. *General Electric Co.*

224—Lamp Ballasts

Bulletin 1203 includes wiring diagrams for fluorescent lamp ballasts. Handy index includes lead lengths, dimensions, and lamp type for over 150 popular ballasts. Bulletin includes 9 schematics under the title of preheat, 6 under slimline and instant start, 9 under rapid and quick start, and 4 under circline. *Advance Transformer Co.*

225—Electric Switches

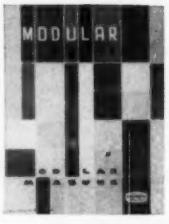
Presswitch – a new concept in switch convenience and utility. Turns on or off with a light press or brush of the hand, finger, or elbow. Blends beautifully with conventional or ultra-modern interiors. The perfect answer for large or small fluorescent lighting installations in factories, offices, institutions, homes. *Harvey Hubbell, Inc.*

226—Lighting Newsletter

Industrial Lighting Newsletter – the first issue of the second volume of the continuing RLM service to specifiers of industrial lighting equipment – includes items on ballasts for high-output 800-ma. lamps, code numbers for mercury lamps, vaportight fixtures, porcelain enamel. Subscriptions are complimentary to consultants. *RLM Standards Institute, Inc.*

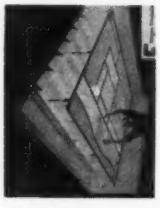
227—Troffer Lighting Systems

Catalog pages section 2 illustrate and describe Versaline Snap-in and flanged type troffers for recessed mounting in a broad range of ceiling types, and Versaline grid troffers for mounting in Exposed-T furring and Acousti-Line ceilings. Six sizes for general line, rapid-start fluorescent, and Slimline lamps. *The Miller Company.*



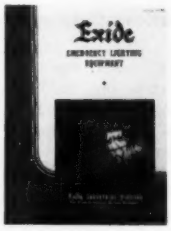
228—Modular Lighting

Bulletin OD689 covers Troffer and Nobilex recessed fluorescent elements. Booklet illustrates how units fit in suspended ceiling, lists all enclosures and lamp combinations available, catalog numbers. Troffers 1 foot wide in 4- and 8-foot lengths, Mobilex 2 feet wide in 4-foot lengths. Plastic and glass enclosures available. *Day-Brite Lighting, Inc.*



229—Ceiling Lighting

Bulletin L/A 1 deals with use of Lumenarea ceiling lighting as a source of light. Specifications show ways to gain unlimited effects using standard parts and colored Polycube® overlap-reverse-interlok plastic louver. No crossbars required so run can be 2 feet or 2000 feet, as desired. *Electro Silv-A-King Corporation.*



230—Emergency Lighting Equipment

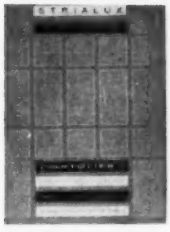
Bulletin 4721 describes Exide battery-powered, centrally-installed emergency lighting equipment. Contains data, diagrams and suggested specifications for both 32-volt and 115-volt systems. Systems are available for lighting-load capacities of from less than 1200 watts to 50,000 watts. *Exide Industrial Division, The Electric Storage Battery Company.*

231—Sylva-Lume Lighting System

New 6-page folder describes and illustrates the revolutionary Sylva-Lume system of wall-to-wall lighting which offers designers unlimited freedom from standard components. Folder describes how color, texture, and form of Sylva-Lume allows ceiling to fit into over-all interior decor, integrating with walls and floor. *Sylvania Electric Products, Inc.*

232—Ballast Overheating

General Electric engineers have answered several important questions about fluorescent ballast overheating in this new eight-page bulletin, "Let's Talk About Ballast Heating," GED-3328. The bulletin describes in easy-to-read language the causes, effects, and most important, the solution to overheating. *General Electric Co.*



233—Recessed Lighting

A new comprehensive 24-page Strialux brochure details the latest in recessed fluorescent lighting. It shows how 2 ft x 2 ft and 2 ft x 4 ft modular units of Strialux fit the new suspended ceiling systems, and describes all design features. Useful detail drawings of new ceiling constructions, complete lighting data, and specifications are included. *Lightolier, Inc.*

234—Residential Lighting Catalog

This is a 55-page catalog with full-color illustrations of room settings and suggested solutions for a variety of residential and contract lighting problems. An illustrated index provides a simplified reference guide. A commercial lighting catalog called "Inspiration Lighting" is also offered. *Thomas Industries, Inc., Moe Light Div.*

235—Specifications Book

New specifications are included in the 1958 RLM Standard Specification Book, a reference guide for those concerned with industrial lighting units, covering: 2-lamp and 3-lamp special service fluorescent units; 3 types of units using 800 ma. fluorescent lamps; new incandescent reflector sizes; new mounting specifications. *RLM Standards Institute, Inc.*

236—Fluorescent Lighting Fixtures

Catalog pages section 1 illustrate and describe Miller Richmond fixtures for schools, offices, stores. 2 and 4 lamp, 4 and 8 foot sizes with 35° x 25° and 45° x 45° louvers. Well shielded direct-indirect lighting. For rapid-start and Slimline fluorescent lamps. The catalog is fully illustrated, includes design details. *The Miller Company.*

237—Over-All Ceiling Lighting

This packet of two and four page brochures features the Gratelite Louver Diffuser for over-all ceiling lighting. It includes full installation, performance, and construction data; description of the new Una-Tee suspension system; time-saving estimating tables; and Gratelite ceiling layout information. *The Edwin F. Guth Co.*

238—Press-Action Switch

"Presswitch"—quality you can put you finger on. For inductive ac lighting, including large 277 volt fluorescents. Withstands inrush and resistance loads at full rating and motor loads up to 80 percent of switch rating. Available in single-pole, double-pole, three-way, and four-way with ivory or brown nylon buttons. *Harvey Hubbell, Inc.*

MATERIALS HANDLING AND STORAGE

239—Car Pullers

Ten-page bulletin L-6 shows capstan type car puller for moving cars a short distance using manila rope. Three styles of drum car pullers for heavy duty car moving, shuttle work, or for servicing very large areas are also listed, as well as barge movers for shifting barges back and forth during unloading. *Clyde Iron Works, Inc.*

240—Linings and Tile Tanks

Scope of complete service — design, installation, and maintenance — of corrosion-resistant linings and tile tanks described in 4-page bulletin which also describes the types of membrane linings and tile types and shapes used in lining and erecting silos, slurry tanks, chests. Bulletin A-156. *The Stebbins Engineering and Manufacturing Company.*

241—Overhead Traveling Crane

Bulletin 4320 describes Conco type "DM" overhead electric traveling cranes, available in capacities to 15 tons, in spans up to 60 feet, for floor or cab operation. Conco cranes mean safe, fast, low-cost handling of materials—production moves more smoothly. *Conco Engineering Works, Division of H. D. Conkey & Company.*

242—Concrete Storage Bins

Bulletin describes Super-Concrete storage bins for industry. Explains how bins are engineered specifically to purchaser's requirements. Describes the installation of concrete roofs and elevated floors, when desired. Lists materials stored and gives prominent users. Contains tables of capacities and photographs of typical installations. *Neff & Fry Co.*

243—Dump Bucket

Booklet 32783 describes a new dimension in earthmoving and materials handling. A side dump bucket for Caterpillar-built No. 933 (series C) and No. 977 (series E) Traxcavators provides the answers, reduced cycle time, and close quarters operation. Brief specifications are given for both machines. *Caterpillar Tractor Co.*

244—Pneumatic Conveying

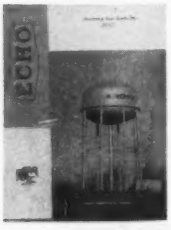
Spencer bulletin 143-B describes pneumatic conveying with stationary and portable systems. A typical diagram of each type is given; also a chart of approximate capacities and photos showing various system components. Examples with illustrations of applications of pneumatic conveyors are shown. *The Spencer Turbine Co.*

245—Process Equipment

Bulletin G-3, "Fuller Equipment For The Process Industries," describes Fuller rotary compressors and vacuum pumps; inclined-grate material coolers; Fuller preheater, Humboldt suspension type; Fuller-Kinyon, Airveyor, and F-H Airslide conveying systems for handling dry, pulverized, granular, and crushed materials. *Fuller Co.*

246—Screw Conveyors

Bulletin 957 explains how Flo-tube moves materials mechanically with simplified manual or automatic controls. Flo-tube moves chemicals, coal, gravel, salt, sand, sugar, wood chips, and similar materials from bins and piles to receiving hoppers or processing machines at predetermined rates, at any angle of incline. *Canton Stoker Corp.*



247—Elevated Water Tank

Echo, third anniversary issue of Graver house magazine offers interesting case histories of Graver-built tanks and vessels in varied uses. Besides an elevated water tank, which solved a water-supply problem in a midwestern city, there are stories about Graver tanks and process equipment for oil-storage terminals, tank cars. *Graver Tank and Mfg. Co.*

248—Sugar Mill Equipment

Catalog 934 covers equipment utilized by the cane, sugar, and bagasse handling industries. Carrier chains, screens, dryers, elevators, buckets, spiral conveyor, and power transmission machinery are covered. Illustrations and detailed specifications make this 64-page manual an essential for sugar mill and allied industries. *Jeffrey Manufacturing Company.*

249—Towboats

Bulletin 239 is a new 28-page booklet describing phases of river towboat design and construction. It is illustrated with more than 50 photographs, including several in full color. It devotes chapters to the specific nature of river transportation, towboat propulsion, control accommodation and accessories, research and design. *Dravo Corp.*

250—Industrial Storage Silos

"Modern Industrial Storage Systems," 12-page brochure 4393, discusses the subject of storage for raw ingredients, semi-processed, or finished materials. The flexibility and adaptability of concrete silos is discussed. Descriptions of component parts and construction are supplemented with line drawings. *The Marietta Concrete Corp.*

251—Safety Electrification

New brochure No. 8-58 describes Insul-8-Bar enclosed conductor systems for cranes, monorails, moving machinery. Clearly demonstrates that Insul-8-Bar systems meet all safety and installation requirements of mobile electrification without the need for special parts or engineering. Brochure is liberally illustrated. *Insul-8-Corp.*

252—Field-Fabrication Tanks

This bulletin shows Richmond Engineering field-fabrication storage tanks for many uses from a variety of materials. Test chambers, stacks, and autoclaves are illustrated. Special RECO field units fabricate installations to API, AWWA, ASME standards. RECO tanks serve pulp, petroleum, and chemical industries. *Richmond Engineering Co., Inc.*

253—Overhead Handling Systems

Bulletin M-32 offers anyone concerned with materials handling a pictorial review of how Whiting Trambeam overhead monorail handling systems fit into various plant operations. Shown are many different types of plants in a great variety of industries – all relying on Trambeam to keep production moving quickly and efficiently. *Whiting Corp.*

254—Steel Derricks

Advantages gained by using Whirlettes – full revolving, self contained steel derricks – are listed in four-page folder MP-49. The hoist is mounted on the rotating structure and only one foundation is necessary. No guy lines or stiff legs are required. Booklet gives specifications, and illustrates typical uses. *Clyde Iron Works, Inc.*

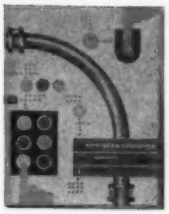
255—Materials Handling Equipment

Bulletin 5000A covers Conco custom-engineered overhead electric traveling cranes, of double girder construction. Can be furnished in a wide range of capacities and spans. Also included are hand-powered overhead traveling cranes, hand-powered and electric hoists, jib cranes. *Conco Engineering Works, Division of H. D. Conkey & Co.*

256—Concrete Storage Bins

Construction of Super-Concrete stave storage bins for industry is explained in the folder, "Bins with the Strength of Pillars." Contains tables of capacities and photographs of typical installations. Lists of prominent users, varieties of materials stored, and other uses for the bins are given in this valuable bulletin. *Neff & Fry Co.*

To order personal copies of these bulletins, please fill



257—Pneumatic Conveyors

Information on how pneumatic conveying has solved bulk-handling problems is presented in bulletin 530. System diagrams point out applications and flexibility of equipment. Photos illustrate typical installations. Bulletin lists materials which can be handled and illustrates available conveyor accessories. *Dracco Corporation.*

258—Reprints for Framing

Reprints suitable for framing of Graver's striking 4-color ads on elevated water tanks are available upon request. The current ad pictures recently completed handsome Berwyn, Illinois tank, and the copy describes the water supply met by the new tank. The ad back indicates standard sizes of Graver water tanks. *Graver Tank & Mfg. Co., Inc.*

259—Book of Tables

This handy reference booklet contains tables of circles and spheres, area and volume formulae, decimals of an inch and foot, tile shapes, standard reinforcing bars, capacities of tanks, conversion factors, and other information for use in designing tanks. Bulletin TC-155. *The Stebbins Engineering and Manufacturing Company.*

260—Loading Assemblies

Twenty-two page bulletin F-32 fully explains loading assemblies for handling hazardous liquids and chemicals. Complete with engineering information and dimensional drawings, this bulletin illustrates how to solve your loading problems, including spring-balanced and counterweighted types. *Jordan Corp., Div. OPW Corp.*

MECHANICAL POWER TRANSMISSION

261—Speed Reducers

A sixteen-page illustrated catalog, describing speed reducers as applied to operating machinery, particularly bridge machinery, is available. Outlined are specifications, service factors, horsepower ratings and dimensions of the particular units illustrated. Gasoline power units are also dealt with. *The Earle Gear and Machinery Company.*

262—Right Angle Gear Drives

Right angle solid shaft gear drives, for centrifugal pumps and industrial use — cooling tower installations, barge service, sewage disposal, fire and flood control — manufactured in a wide range of models to meet specific requirements, are described and illustrated with engineering details in eight-page catalog 28. *Johnson Gear & Mfg. Co.*

263—Texrope Drives

Quick selection tables and formulae for designing V-Belt drives, 42-page bulletin 20B7499, will simplify your drive calculations on variable speed drives. Bulletin 20B6956, a companion bulletin, shows complete selection information on constant speed drives.Other useful drive design data is also provided. *General Products Div., Allis-Chalmers Mfg. Co.*

264—Flexible Gear Couplings

Advantages and typical applications of flexible gear couplings are pictured and described in 16-page catalog C-4, "The Revolutionary New Sier-Bath Flexible Gear Couplings." Couplings are available in standard, vertical, millmotor, floating shaft, and spacer type, and in many special purpose types. *Sier-Bath Gear & Pump Co., Inc.*

265—Gearmotors

Fully illustrated booklet 7223, 33 pages, includes recommendations, ratings, dimensions, and other application data, to assist the consulting engineer in selecting the proper gearmotor or package motor reducer drive for his particular application. This engineering manual describes Moduline gear units for maximum adaptability. *Westinghouse Electric Corp.*

266—Herringbone Reducers

"Philadelphia Herringbone Reducers," catalog H-55, 48 pages, gives full details regarding the entire line of herringbone units: horsepower ratings, capacities, dimensions, parts lists, load capacities, torque ratings, and installation diagrams. These units are available in single, double, and triple reductions. *Philadelphia Gear Works, Inc.*

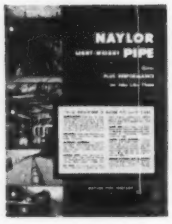
267—Gears

A 20-page catalog describes in general the kinds and sizes of gears manufactured by this company. Its contents deal with spur gears, bevel gears, helical gears, worm gears, racks, non-metallic gears, sheaves, sprockets, special machinery of which gears form a part. Illustrated with photographs. *The Earle Gear and Machinery Company.*

268—Turbine Pump Drives

Right angle turbine pump drives, in standard and combination drive installations and available in a wide range of models to meet specific requirements of high or slow speed prime movers and pumps, are described and illustrated in nine-page catalog 27. Tables and charts show power ratings and average efficiencies. *Johnson Gear & Mfg Co.*

PIPING, VALVES, AND PLUMBING



269—Lightweight Piping

Bulletin 507 lists typical applications of Naylor lightweight pipe in construction and other fields. Presents standard specifications on pipe from 4 to 30 in. diameter. Includes fittings and flanges. Lists connections to meet all pipeline requirements including one-piece Naylor Wedgelock couplings. *Naylor Pipe Company.*

270—Swing Check Valves

New technical bulletin W-11 fully describes rubber-lined cushioned swing check valves for use in pulp, paper, and chemical industries. This valve may also be used in sewage lines for pump check service as well as to prevent reverse flow. General dimensions, parts list, specifications, installation, operation included. *Golden-Anderson Valve Specialty Co.*

271—Ric-wiL Catalog

The new edition of the Ric-wiL product catalog covers construction features for prefabricated, insulated piping systems for steam, hot water, oil or refrigeration distribution lines. Types of systems covered include Hel-cor, Uniline, type J, low temperature, and cast iron. Prefabricated accessories are also included. *Ric-wiL, Incorporated.*

272—Buna-N Rubber Products

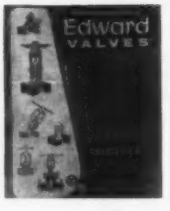
Buna-N hard rubber products – their resistance to heat and oil, physical properties, and resistance to various types of chemicals – are described in four-page folder E-212. It gives data on plug cocks, tees, couplings, pipe caps and plugs, unions, straightway cocks, ells, crosses, reducing bushings, and flanges. *Luzerne Rubber Co.*

273—Diaphragm Valves

Rockwell valve bulletin 800 deals with diaphragm valves for corrosive, abrasive, water, and other industrial pressure and vacuum service. The valve design features a diaphragm for positive sealing and a disc for positive closure, high capacity, low pressure drop, low closing torque, complete safety of closure, and low maintenance. *W. S. Rockwell Co.*

274—Steam Traps

Bulletin SS-142A describes new Strong ductile iron steam traps designed for service to 500 psi and 650 F. Adaptable for use on process equipment in chemical plants and refineries where cast steel is normally required. Available in five standard sizes with pipe connections from ½ to 2 inches. *Strong, Carlisle & Hammond.*



275—Cast and Forged Steel Valves

Edward 28-page condensed catalog 105 includes dimensions and illustrations describing non-return (stop-check) valves, globe and angle Univalves, and small size globe valves designed for chain or extension operation in vertical lines. Also included is the Edward Mudwonder valve for abrasive fluids. *Edward Valves, Inc., Rockwell Manufacturing Company.*

276—Deck Fountain Unit

Specification and detail sheet gives full information on Haws series 2800 one-piece molded fiberglass deck-top, receptor, and fountain unit with squared ends for flush mounting in continuous deck-tops. Receptor may be equipped with Haws faucets and fountains, is available in varied colors, alkali and acid-resistant. *Haws Drinking Faucet Co.*

277—Fine-Screen Strainers

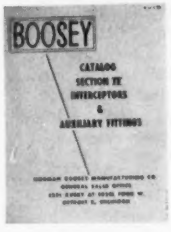
Helpful information about screw-end, socket-weld, and flange strainers for steam or liquid lines is presented in eight-page Yarway bulletin S-205 (57). How they protect steam traps, reducing valves, and high-grade mechanical equipment from dirt, chips, scale, and other particles is explained. Gives tips on installation. *Yarnall-Waring Co.*

278—Carbon Steel Plug Valves

Carbon steel plug valve catalog 1100 covers complete specifications and descriptive literature on ACF carbon steel lubricated plug valves. Data deals with ASA 150 lb. and ASA 300 lb. lubricated plug valves in sizes ½ in. through 16 in., including many venturi, multiport, and steam-jacketed types. *W-K-M Division of ACF Industries, Inc.*

279—Pipe Fittings, Flanges, Valves

New 24-page catalog lists a full line of unplasticized PVC (polyvinyl chloride) pipe fittings, flanges, and valves. Technical section gives operating pressures, flow vs. pressure loss, chemical resistance of PVC, and such, for both high and normal impact PVC. Step-by-step solvent cementing and threading procedure included. *TUBE TURNS Plastics, Inc.*



280—Interceptors, Auxiliary Fittings

A new presentation of Section B-49-X-IV gives the consulting engineer all information necessary for intercepting liquids and solids before they get into building sewers. Included are such materials as gasoline, grease, oil, solvents, insoluble materials such as plaster, precious metals, hair and lint, paint, wax. *The Norman Boosey Manufacturing Company.*

281—Check Valves

Circular V-63 lists design features and available sizes of Fairbanks bronze and iron check valves. Bronze check valves include swing and lift types, screw, flange, solder, and Fairco-Braze ends and Underwriter's-Approved valves for LP-gas service. Iron body valves are bronze-mounted swing type. *The Fairbanks Company.*

282—Remote-Type Water Coolers

Bulletin T-417 describes remote water-cooler application in plants, restaurants, schools, and like buildings. Single condensing unit serves multiple bubbler outlets or glass-filling stations; installs behind building walls, on overhead wall brackets; 6 to 24 gph. Complete specifications, dimensions, and capacity ratings. *Temprite Products Corp.*

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283—Welded Stainless Piping

"The Plastic Ductility of Austenitic Piping Containing Welded Joints at 1200 F" is a report of an investigation into the problem of selection of materials for main steam piping. It gives data on the stress rupture characteristics of types 316 and 347 stainless steel piping adjacent to welded joints. *Pittsburgh Piping and Equipment Co.*

284—Valve Manual

Forty-page catalog B-2 is designed to help engineers select valve types, understand their characteristics, and determine space requirements. It includes such useful data as: pressure drop and flow tables, conversion tables, theory and application, recommended materials, and describes Pratt valves and operators. *Henry Pratt Co.*

285—Corrosion Preventive Tape

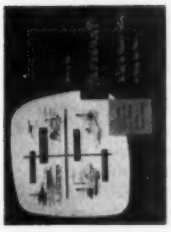
Bulletin 3002 offers information covering 655 Safe-T-Clad tape for protecting pipes or conduit in corrosive areas. Recommended application specifications, preparation of pipe surfaces, and technical charts for coverage requirements, performance properties, and packaging information are included. *Dearborn Chemical Co.*

286—Glass Lined Sewer Pipe

Folder deals with the glass lined sewer pipe with a mechanical joint. Amvit Glas-Glaz pipe is available in 4-ft. lengths. It is root and infiltration proof and is glass lined inside and out. The pipe has been designed for an under-the-house drain and also as a house-to-street sewer. *American Vitrified Products Company.*

287—General Purpose Valve

New drop forged steel screw and socket weld end valves, in sizes ¼ through 2 in., rated at 800 psi at 850 F and 2000 psi at 100 F. are described in 32-page "General Purpose Valves, Gate, Globe, and Angle Types." Pressure-temperature ratings, specifications, and dimensions are given for each type valve. *Henry Vogt Machine Co.*



288—Pipe Protection

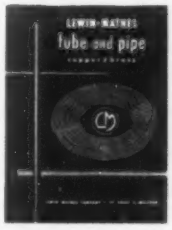
Hot coal-tar protection in easy-to-apply tape form for pipe, pipe fittings and joints, conduit, cable, insulated pipe, tie rods. Material is heated lightly to soften the pitch, then spirally wrapped onto pipe surface. Tapecoat provides long-life protection that is equivalent to a hot applied coal-tar pipeline coating. *The Tapecoat Company.*

289—Valve Catalog Digest

This new valve catalog digest furnishes the latest coverage of the OIC bronze, iron, cast steel, forged steel, and lubricated plug valve lines in a condensed form. Classified by type and pressure class, and illustrated, this edition also includes face to face dimensions for each size and type of valve listed. *The Ohio Injector Co.*

290—General Service Valves

Dimensions and detail drawings, plus a parts list are included in 20-page bulletin E-165. Bulletin discusses class 125 single and double disc, class 250, cylinder-operated valves, lubricated valves, valves for emergency protection, steam-jacketed valves, and valves for boiler blow-off. Fully illustrated. *Everlasting Valve Co.*



291—Tubing And Piping

This 12-page bulletin lists each type of Lewin-Mathes copper and brass tubing and piping with the temper, lengths, fittings, uses, and specifications. Sizes and capacities are in table form to aid in selection. Photos show use for water piping, air conditioning, heating, underground service and drainage lines. *Lewin-Mathes Co.*

292—Pipe Expansion Joints

Bulletin 31 contains layout diagrams, photographs, and data on how to solve problems of thermal expansion and contraction in piping economically with flexible ball joints. Applicable to piping runs of any length and of any diameter from ¼ inch to 12 inches, including high temperature steel piping. *Barco Manufacturing Co.*

293—Steam Heating Specialties

Illinois steam heating specialties – packless radiator valves, thermostatic and float traps, vapor systems, and boiler room specialties – are described in eight-page bulletin 201. Cross sections, elevation drawings, specifications, and a description of component parts are included for each item in the line. *Illinois Engineering Co.*

294—PVC Pipe

Corrosion ratings in 400 chemicals are listed in types I and II PVC, and for eight ferrous, alloy and nonferrous metals. Characteristics, applications, properties, and installation practices are described in 30 pages. Engineering data includes working pressures at elevated temperatures, head loss, and friction factors. *A. M. Byers Co.*

295—Dead-End Temperature Regulator

Four-page bulletin J-180 fully explains how the lapped, all metallic, sliding gate and plate temperature regulating valve seat assures deadend service, accurate regulation, and long, trouble-free life. Complete specifications are listed in this bulletin, with capacity charts for steam and water. *Jordan Corporation, Div. OPW Corporation.*

296—Welding Fittings

Bulletin TT867 provides dimensional and technical data for the complete line of TUBE-TURN light weight welding fittings. Also discusses the economies of light weight piping in gas distribution, plant process piping, air conditioning, shipbuilding, etc. through lower material costs, less labor, and increased efficiency. *TUBE TURNS, Inc.*

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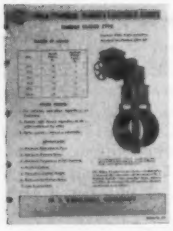


297—Butterfly Valves

Bulletin 574-8 deals with manual and automatic flanged butterfly valves made to specifications of American Water Works Association for water service in providing positive tight shutoff under shutoff pressures of 25, 50, and 125 psi. Complete description of construction, operations, and dimensions given for valve sizes to 72 in. *W. S. Rockwell Co.*

298—Drinking Water Coolers

Bulletin T-450 describes 24 basic models of drinking water coolers, capacities from 3 to 27 gph, with aircooled or watercooled condensing units. Explosion-proof models, all stainless steel, hot and cold, refrigerated storage compartment type are listed. Complete specifications, capacity ratings are included. *Temprite Products Corp.*

299—Key Refinery Fittings

Bulletin KR 1057 is a revised edition of Key bulletin 655 and describes Key 5000 type patented refinery fittings, available in 18 different sizes in 850 lb. and 1275 lb. series, and to maximum temperatures of 1200 F. Bulletin contains dimension tables, pressure-temperature charts, and material section. *W-K-M, Division of ACF Industries, Inc.*

300—Back Water Valves

A new presentation of Section B-49-C-III gives the consulting engineer everything at his fingertips for solving any problem encountered with flooded basements or manholes. Included are complete descriptions of backwater valves, line or end type, available with manual and/or automatic shutoffs. *The Norman Boosey Manufacturing Company.*

301—Fabricated Fittings

Bulletin 525 illustrates standard and special fabricated fittings which help in planning piping and equipment layouts. Data includes specifications and prints on standard fittings for lightweight pipe. The bulletin also illustrates special fabrications designed to save time and labor in modernizing piping systems. *Naylor Pipe Company.*

302—Instrument Valves

Bulletin 571 (4 pages) gives full information on Edward forged steel instrument valves with integral hard-faced seats. Included are descriptions, design characteristics, dimensional details, material specifications for full line ranging from ¼ in. to 1 in., and ratings to 850 F at 2500 psi. *Edward Valves, Inc., Rockwell Manufacturing Company.*

303—Coke-Quenching Valves

New technical bulletin W-15 fully describes coke-quenching valves. Installation arrangements, parts lists, and dimensions are included for both the G-A coke-quenching valves and their counterpart, the G-A drain valves. The latter are drop-tight when closed, provide full pipeline openings in open position. *Golden-Anderson Valve Specialty Co.*

304—PVC Pipe Fittings

Bulletin PF 1200, eight pages, presents a list of applications for PVC pipe and fittings where corrosion resistance, nontoxicity, and noncontamination are required. Mechanical, electrical, thermal, and miscellaneous properties of both normal impact and high impact PVC products are in table form for easy reference. *The Luzerne Rubber Co.*

305—Steam Specialties

New 60-page catalog 69-A, "Strong Steam Specialties," contains complete descriptions, illustrations, dimensions, capacities of the complete line of Strong steam traps, strainers, separators, flash separators, reducing valves, block steel valves, and engine stops. Includes condensed tables of steam trap pressures, capacities. *Strong, Carlisle & Hammond.*

306—Insulated Piping Systems

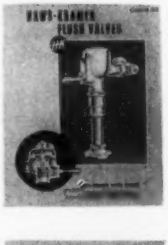
This 90-page catalog on Ric-wiL insulated piping systems for underground or overhead use is divided into five sections, each tabbed and indexed for easy reference: Product, Engineering, Specifications, Drawings, and Installation. All engineering data have been brought up to date as of February, 1958. *Ric-wiL, Incorporated.*

307—PVC Plug Valve

Bulletin TTP122 describes the first all PVC (polyvinyl chloride) plug valve and its many applications in corrosive service. Valve is injection-molded, self-lubricating, provides full flow, positive closing, and is available with either socket or threaded type ends. Complete dimensional data is included. *TUBE TURNS Plastics, Inc.*

308—Expansion Joints

New enlarged bulletin EJ-1916 (57) gives thorough data on Yarway type W Gun-Pakt expansion joints. Details of design and construction (including weights and dimensions in complete charts) are presented, with instructions on figuring pipeline expansion and best installation and maintenance procedures. Twelve pages, illustrated. *Yarnall-Waring Co.*



309—Flush Valves

Haws-Kramer catalog 358 has 20 pages of complete description of new Haws-Kramer Nyla-Phragm flush valve and piston-type flush valve. Rough-in drawings for 40 combinations, stop valves, vacuum breakers, flush valve variations, comparison charts, and complete listing of Haws-Kramer representatives are included. *Haws-Kramer Flush Valves.*

310—Bronze and Iron Body Valves

Fairbanks catalog 57 describes Fairbanks bronze and iron body valves. Bronze valves (125 lb. SWP to 300 lb. SWP) include globe, gate, and check with screw, flange, solder, and Fairco-Braze ends, and LP-gas and oxygen valves. Iron body valves (pressures 125 lb. SWP to 250 lb. SWP) include UL-approved and AWWA valves. *The Fairbanks Co.*

To order personal copies of these bulletins, please fill

311—Water and Sewer Lines

Catalog TR-199A is leatherette bound loose-leaf book. A 200-page collation of facts and data for engineers about Transite asbestos-cement pipe for water and sewer mains. Includes indexed sections devoted to strength, flow characteristics, tightness of joints, installation economies, specifications, acceptance. Includes 100-page installation guide. *Johns-Manville.*

312—Solenoid Valves

Selecting stocked solenoid valves is simplified with new 8-page ASCO publication 505. Valves listed are available for immediate delivery. Statistics on pipe and orifice sizes, pressures, CV flow factors, electrical characteristics, and enclosures are provided, along with list prices and brief descriptive information. *Automatic Switch Co.*

313—Tin-Lined Piping

Bulletin 139 describes Barnstead's complete line of tin-lined pipes, fittings, and valves. Combining the chemical protection of pure tin with the strength and durability of threaded pipe, this tin-lined equipment protects the purity of distilled water from the point of origin to the point of ultimate use. *Barnstead Still & Sterlizer Company.*

314—Steam Trap Manual

"The Armstrong Steam Trap Book, 2nd Edition," 46-page catalog J, explains the benefits of good trapping and how you can obtain them. A handbook section provides capacity charts and other data necessary to the correct trapping of all major classes of steam-heated equipment. Manual is completely indexed. *Armstrong Machine Works.*

315—Rigid Plastic Pipe

Bulletin KT-2-58 provides complete technical data on the Kraloy PVC (polyvinyl chloride) rigid plastic pipe line. Physical, thermal, and miscellaneous information is included for pipe sizes from ⅜ to 10 in. diameters, as well as diameters, inside and out, wall thicknesses, maximum pressures, plus weight. *Kraloy Plastic Pipe Company.*

316—Snow Melting Systems

"Steel Pipe Snow Melting and Ice Removal Systems," 32 pages, presents the case for snow melting systems and shows typical installations in commercial and industrial locations. Design data is complete with information on anti-freeze mixtures, sizes, and spacing. *Committee on Steel Pipe Research, American Iron and Steel Institute.*

317—Valves

Catalog No. 56 describes and illustrates the complete lines of Jenkins Diamond-marked bronze, iron, cast steel, and stainless steel valves recommended for every industrial, commercial, engineering, domestic, and plumbing and heating service up to 600 psi. Includes data on selection, installation, and maintenance. *Jenkins Bros., Inc.*

318—Safety Cleanout Valves

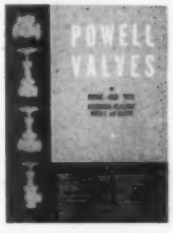
Bulletin 4004 describes the Petrometer safety cleanout valve for safe removal of water and sludge from storage tanks containing volatile liquids, eliminating danger of fire or explosion. Construction features and operation are discussed fully. The valve can be connected to the tank through liquid level indicator lines. *Petrometer Corp.*

319—Stainless Steel Fittings

This 22-page catalog explains how Speedline stainless steel fittings reduce piping costs by allowing the designer to take advantage of the new and more economical schedules 5 and 10 stainless steel pipe. A schematic drawing illustrates industrial applications. *Speedline Stainless Steel Fittings Div., Horace T. Potts Co.*

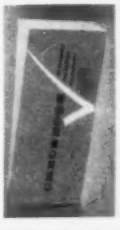
320—Pipe Welding Fittings

Catalog 54 describes and illustrates the complete line of butt welding fittings, explains advantages of unique method of manufacture. Elbows and other fittings up to 36 inches O.D. are listed with complete dimensional data. Catalog also describes facilities for fabricating piping and pipe coils. *Midwest Piping Company, Inc.*



321—Valve Catalog

24-page composite catalog on bronze, iron, steel, and alloy valves for controlling the flow of water, oil, gas, air, steam, and corrosive fluids. Lists pressure and temperature ratings and available sizes. Also shows flush bottom tank valves, lubricated plug valves, liquid level gauges, and other engineering specialties. *The Wm. Powell Co.*



322—Fire Protection Equipment

"Checkbook" unifies in general terms the wide range of approved applications of non-sprinkler fire-fighting equipment. This speeds pre-planning and helps interpret and implement local requirements for the final specification of such equipment. "Checkbook" specifications are in handy tear-out form. *W. D. Allen Manufacturing Company.*

323—Pipe Protection Tape

Tapecoat X is a coal-tar protective coating in tape form for pipe, pipe fittings and joints, conduit, cable, insulated pipe, tie rods. Material is heated lightly with a torch, then wrapped onto pipe surface with one-half-inch overlap. Provides protection on underground pipe equivalent to hot-applied coal tar. *The Tapecoat Co.*

324—Multiple Disc Valves

Bulletin 5200-A (new) describes features of Cochrane Multiple Disc relief valves for steam systems. Specifications for vertical, horizontal, and angle styles in sizes from 4 in. to 48 in., 0 to 25 to 0 to 100 psig set pressure. Installation diagrams, data on selecting and specifying, and list of standard materials available for valve parts also included. *Cochrane Corp.*

325—Jointed Clay Pipe

Jointed vitrified clay pipe known as Amvit, with a built-in mechanical joint made from polyvinyl chloride, is described in four-page folder. Advantages such as infiltration prevention, quick installation, immediate backfilling, better flow, shock absorption, and quick testing in the field are pointed out. *American Vitrified Products Co.*

326—Taper Face Flanges

New 4-page bulletin TT821 describes the newly developed TUBE-TURN lightweight taper-face welding neck flange. It is designed to join low-pressure or lightweight welded piping to 125-lb. valves and pumps, and eliminates the danger of overstressing or damaging them. For use in water, oil, and gas service. *TUBE-TURNS, Inc.*

327—Valve Comparison Chart

"OIC Diamond Anniversary Valve Comparison Chart," bulletin 194-R2, recently completed, covers the latest models of new valve designs manufactured by each company in the valve business. It lists, for the first time, a complete valve trim comparison table. The chart is arranged for easy cross reference. *The Ohio Injector Co.*

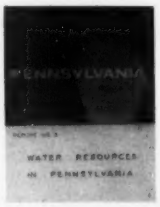
328—Snow Melting Systems

Diagrams of actual layouts emphasize design and application in "Wrought Iron Pipe for Snow Melting Systems." Heat requirements, coil and grid patterns, use of anti-freezes, auxiliary equipment, paving, and fill are among design considerations discussed. Reports on airport and roadway systems also available. *A. M. Byers Co.*

PLANT SITE SELECTION

329—"Tax Climate" in Pennsylvania

The improved Pennsylvania "Tax Climate," new Pennsylvania Department of Commerce booklet, tells the whole story of steps which have been taken recently to create favorable tax advantages for new industry and expanding established industries in Pennsylvania. Tax changes of interest to consultants are discussed. *Pennsylvania Department of Commerce.*



331—Pennsylvania Water Resources

Water resources in Pennsylvania is one of a series of plant location factors reports prepared by the Pennsylvania Department of Commerce. The water study, complete with statistical data, maps and tables, presents latest detailed information on the state's water supplies and great potential resources for industry. *Pennsylvania Department of Commerce.*

330—Plant Sites

"Look Where a Site is Production-Right," 24-page brochure, presents data useful to consultants and executives responsible for new plant location. Illustrated with colored maps, it describes power, fuel, labor, water, weather, key materials, transportation, and plant sites that offer best plant site possibilities. *Baltimore and Ohio Railroad.*

332—Plant Site-Marley Neck

"Where Can You Pick a Plant Site Plum Like This?" is a broadside describing the largest deepwater plant site on the Atlantic seaboard, Marley Neck, Port of Baltimore. The booklet includes colored maps and a comprehensive air view of some 4200 acres on Chesapeake Bay near the heart of the city. *Baltimore and Ohio Railroad.*

POWER EQUIPMENT & FUELS

333—Vibrating Grate Stoker

New water-cooled vibrating grate stoker (in sizes from 25,000 to 150,000 pounds of steam per hour) requires no dust collector. No smoke, even at low ratings. Burns low-grade coal with top efficiency. Easily adapted for gas or oil in combination with coal, or singly. Minimum maintenance. *American Engineering Company.*

335—Guide Specifications

Bulletin AIA-30-A gives complete guide specifications for typical low-pressure heating plants operating at 20,000 equivalent direct radiation or 4.8 million Btu/hr. Adaptable to design loads of 3000 to 24,000 EDR or 750,000 to 5.5 million Btu/hr. The 64-page bulletin is a guide for consulting engineers. *Bituminous Coal Institute.*

334—Water Tube Steam Generator

Water tube type D Superior steam generators with capacities up to 50,000 lb steam per hour are described in eight-page bulletin. With the literature comes a 12-page folder of specifications prepared to aid consulting engineers in selection, evaluation, and specification of water tube packaged units. *Superior Combustion Industries, Inc.*

336—Atomizing Burners

The Todd Vee-Cee type variable capacity mechanical atomizing fuel oil burner for installations with widely fluctuating loads is fully described in four-page bulletin TD56-16X. Bulletin shows special construction that gives uniform, easily oxidized spray, constant pressure, and quick cold starting. *Todd Shipyards Corp., Products Div.*

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337—Integral-Furnace Boilers

Bulletin G-76E describes the B&W Integral-Furnace boiler – Type FM. Complete size, dimension, and weight specifications along with interesting operational data are included. This completely shop-assembled, compact, reliable unit has a capacity range to 50,000 lbs steam per hr, pressures to 250 psi. *The Babcock & Wilcox Co.*

338—Stationary Engines

Bulletin SA-610 describes Climax Blue Streak K-series stationary engines for sewage treatment plants, standby equipment, generators, blowers, water pumps, and ventilating fans. Detailed specifications and performance curves included. Engines operate on natural gas, gasoline, sewage gas, or butane. *Climax Engine Manufacturing Co.*

339—Facts About Boilers

"Forty Facts You Should Know About Kewanee Boilers" (bulletin 1130) is a new presentation of the specific company and product advantages gained by owners of Kewanee Boilers, both high and low pressure . . . firebox and scotch types . . . 18 to 651 hp listed in one compact attractive booklet. *Kewanee Boiler Division, American-Standard.*

340—Industrial Oil Burner

Factory engineered and built integral air register for control of combustion air is feature of Petro WR burner. Register controls entire air supply for maximum combustion efficiency. Models available for firing all fuel oils, including number 6, and for dual fuel oil-gas firing. For scotch or firebox boilers. Form 3382 has four pages. *Petro.*

341—Series Turbocharging

Series turbocharging bulletin ST-82, describing the new method of turbocharging 2-cycle engines, provides descriptions and specifications of equipment for application to Cooper-Bessemer 2-cycle engines, either at manufacturer's plant or in the field, to develop full-rated engine power even at elevated altitudes. *The Cooper-Bessemer Corp.*

342—Forced Draft Burner

Fundamental difference between an ordinary gun type burner and the Johnson Bankheat forced draft burner is explained in bulletin 10M-2-57. Installation drawings show the burners in operation in warm air, hot water, and steam systems. Sizes and capacities are listed for units burning oil, gas, or a choice of either. *S. T. Johnson Co.*

343—Packaged Boilers

Bulletin BA-256, four pages, presents in table form complete design specifications for Continental automatic boilers with 100 to 500 hp ratings with modulating control. The bulletin illustrates and describes advantages and features of the design. Boilers fire Nos. 2, 5, and 6 oil or gas. Specifications are given. *Boiler Engineering & Supply Co., Inc.*

344—Steam Turbines

A collection of twenty bulletins, illustrating and describing Terry solid-wheel, helical-flow turbines; single-stage and multistage axial-flow turbines; and a number of different types of governors for various applications. Approximate dimensions are included for many of the types and sizes of turbines described. *The Terry Steam Turbine Company.*

345—Forced Draft Commercial Burner

Form 5808 describes light oil, gas, and dual-fuel oil gas burner designed for operation against firebox pressure. Fires number 2 fuel oil and/or natural or LP gas. Special burner head produces high combustion efficiency and prevents flame pulsation. Models available for firing pressurized or natural draft boilers. *Iron Fireman Manufacturing Co.*

346—Strainers For Liquids

Bulletin 6 deals with liquid strainers, single and duplex, for pressures from gravity to 900 psi. Capacities from 6 to 7500 gpm of water or 50 viscosity oil at 6 psi pressure drop. Mesh sizes 8 to 200, depending on liquid and contaminant. Strainer basket catches all contaminant; none is left in shell or piping. *William W. Nugent and Company, Inc.*

347—Diesel Engines

Complete 80-page catalog includes power curves, sectional drawings, and subassembly photographs of six basic engines in 19 models, a power range of 100 to 2150 bhp. Diesel, gas, and dual fuel engines and generator sets are available as a custom installation. Use of low cost fuels is discussed. *White Diesel Engine Div., The White Motor Co.*

348—Steam Generator

Specification sheet describes 750 hp standard design steam generator for light and heavy oil and/or gas. A minimum of 80 percent efficiency is guaranteed in two passes. Equipped with any of five burner arrangements. Optional equipment, inspection, elevation, and painting are included. *Cyclotherm Div., National-U.S. Radiator Corp.*

349—Mechanical Draft Fans

A new 4 page bulletin (FMD-101) describes forward-curve mechanical draft fans for central power stations and general industrial service. Bulletin contains a chart showing pressure characteristics of induced draft fans. The large number of blades provide high-volume air movement, and slow fan speeds mean minimum noise. *Chicago Blower Corp.*

350—Standby Power

Booklet 32876 describes the advantages of diesel-electric generating sets available from Caterpillar dealers. Space, fuel, and operating costs are discussed. Cutaways show typical Cat electric set. Brief specifications are given for 17 different engine models and a list of accessory equipment is also included. *Caterpillar Tractor Co.*

351—Induced Draft Fans

Catalog 905 covers the new type DN Dynacurve fan which introduces a new concept of induced draft equipment design. Distinguishing features are listed as: low tip speed, 36 aerodynamically curved blades, minimum space requirements, and high efficiency over wide performance range. Various arrangements are shown. *Clarage Fan Co.*

352—Condenser Expansion Joints

Discussion of expansion problems of turbine exhausts with special reference to modern, large, or twin condensers is presented in this four-page bulletin. It shows construction of the Henry Pratt rubber belt expansion joint, and details advantages, such as simplified engineering of piping and temperature tolerance. *Henry Pratt Co.*

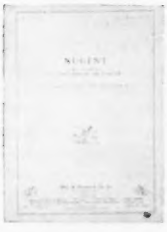
353—Continuous Cleaning Stoker

Bulletin 800 describes and illustrates the Detroit RotoStoker "CC" — a spreader stoker with overthrow rotor feeders. The unique design reciprocating grate continuously discharges ash at the front. Smokeless operation . . . burns a wide variety of coals. For boiler capacities to 75,000 pounds of steam per hour. *Detroit Stoker Company.*

354—Retracting Soot Blower

Bulletin 1079A describes improved Model IR short retracting soot blower for cleaning water cooled boiler furnace walls, hopper slopes, or narrow portions of tube banks adjacent to walls. Removes all dust and most slag deposits. Air motor, electric motor, or manual operation. Operates in very hot zones. *Diamond Power Specialty Corporation.*

355—VP Boilers

Catalog P391, 16 pages, describes the new Type VP package boiler. Following a section of background information is an outline of principal design features. These boilers are shop assembled and provide steam capacities from 4000 to 42,000 lb per hr. Space requirements and specifications are in table form. *Combustion Engineering.*

356—Filters For Liquids

Nugent bulletin 7A deals with gravity or pressure liquid filters, single and duplex types, for working pressures to 900 psi. The filters have capacities from 30 to 1200 gpm of 35 SSU viscosity liquids at 3 to 8 psi pressure drop. The filters will remove insoluble particles as small as 3 microns. *William W. Nugent and Company, Inc.*

357—Diesel Engines

Alco Products, Inc. has released new catalog DE-6, on Alco 251 Diesels. Brings you increased power and dependability for all applications—at less cost. Maintenance has been reduced and simplified. Catalog contains complete dimensions and specifications. These diesels are designed for low-cost, dependable operation. *Alco Products, Inc.*

358—House Organ

Three separate issues of Power Points Digest, Volume 13, Numbers 1, 2, 3 tell how prominent manufacturers use Onan electric plants, generators, and engines. Number 1 deals with engine applications, telling how Thermo King, Millar Electric incorporate Onan engines in their products. Other issues deal with electric plants. *D. W. Onan & Sons, Inc.*

359—Hot Water Boilers

"Package Boiler Economy for Modern Hot Water Systems," describes Cyclotherm's Cyclonic Combustion, a patented principle, now incorporated in a design to efficiently produce hot water. No other type boiler can match the package unit for economy of space and fuel consumption. *Cyclotherm Div. National-U.S. Radiator Corp.*

360—Steam Condensers

This 24-page catalog presents a few of the recent additions to the list of Conseco power plant steam condenser installations. Conseco condensers have deep water boxes, wide tube spacing, outside steam belt, internal stiffening of tube sheets without use of through stays, full deaerating hotwell. *Condenser Service & Engineering Co., Inc.*

361—Forced Draft Package Burners

If your client needs a factory assembled burner that can be installed with minimum cost and time, send for four-page bulletin 10M-2-15-57 on the Johnson forced draft package burner. Units that burn oil, gas, or either are pictured with a detailed description of operation and special construction features. *S. T. Johnson Company.*

362—High-Speed Gears

Eight-page bulletin S130, describing Terry high-speed gearing for speed-increasing or speed-reducing service. Designs for gears, gear cases, bearings, and the lubrication system are fully illustrated and explained in the text. Approximate over-all dimensions are given for the smaller units. *The Terry Steam Turbine Company.*

363—Automatic Boilers

These two bulletins cover Series E and F Continental automatic boilers with ratings of 20 to 80 hp, with on-off control and modulating control. Units use No. 2, 5, and 6 oil or gas or can be furnished to burn either. Bulletins give specifications, dimensions, capacities, types, and illustrations of various sizes. *Boiler Engineering & Supply Co., Inc.*

364—Fan Type Underfeed Stokers

Bulletin 203 contains specifications for using Vulcan stokers where capacities up to 3500 lbs of coal per hour for loads up to 800 hp are required. "Synchro" combustion controls automatically adjust fuel-feed, air supply, boiler draft, and combustion rates. "Turbo-Aire" system complies with smoke regulations. *Canton Stoker Corp.*

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365—Compact Packaged Boiler

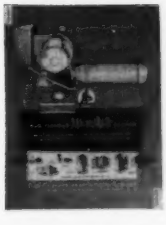
New 3-color catalog describes features of the Superior Compact packaged boiler. Unusually compact, providing economies of installation, the Superior Compact has four-pass design, 5 sq. ft. of heating surface per bhp, and induced draft. Data and dimensions are included for 11 sizes from 20 to 200 bhp, firing oil or gas, or both. *Superior Combustion Industries.*

366—Stationary Engines

Bulletin SA-542-D describes Climax Blue Streak V-122 and V-125 stationary engines, 520 and 610 maximum hp. Specifications and performance curves given. Consistent design found in Climax V Series engines provides for maximum interchangeability of wearing parts, greater value to the purchaser. *Climax Engine Manufacturing Co.*

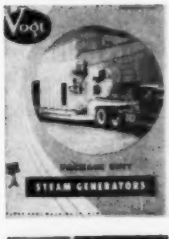
367—Spread Stokers

A compact, automatic coal firing unit for installations of 175 hp to 350,000 pounds of steam per hour and upward. Engineered for top efficiency with both low and high ash coals. Exclusive conveyor feeder won't clog, provides even distribution and continuous feeding of 50 to 7500 pounds of coal per hour. *American Engineering Co.*



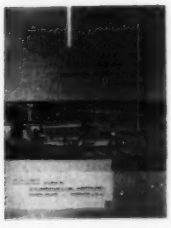
368—Heavy Oil Burner

Form 5631 describes the MicroMist low pressure burner for firing fuel oil through No. 5. Includes electric ignition which eliminates need for gas pilot and additional expense for piping. Features complete oil atomization by compression to reduce air-oil mixture to a fine mist. Integral pre-wired control panel included. *Iron Fireman Mfg. Co.*



369—Packaged Steam Generators

Bulletin PSG-2, 10 pages, presents design and construction details, tables of capacities, dimensions, and weights of package unit type steam generators. Available in three standard pressures of 175, 250, and 375 psig, the boilers are designed to be used with many different types of firing and control equipment. *Henry Vogt Machine Co.*



370—Coal for Heating and Cooling

This 16-page brochure describes fully the boiler plant for heating and cooling the recently completed Hillside Shopping Center, Hillside, Illinois. This is another example in a series of well-engineered coal-fired plants. Drawings are included showing the boilers and coal and ash-handling equipment. *Bituminous Coal Institute.*

371—Electric Plants

Catalog KEP56-1, 24 pages, shows the line of Kohler electric plants used as an independent source of electricity for sole supply and for automatic standby when central station power fails. Sizes range from 500 w to 50 kw, gasoline and diesel. Battery charging units in 6, 12, 36, and 140 v capacity are described. *Kohler Co.*

372—Boiler Service Valves

21-page bulletin E125, Everlasting boiler service valves, contains quick and slow opening straightway valves – Model W, angle valves, "y" valves, duplex blow-off units, water column valves – Model W, and fire protection valves – opening and closing types. Includes a full page of material specifications. *Everlasting Valve Co.*

373—Petro Burners

Twenty-page catalog describes Petro commercial-industrial oil, gas, and dual fuel burners used for heating, power, and process steam requirements. Includes section on "How to Select a Burner." Illustrates several typical installations and various burners, from 8-gallon oil capacity thru 200 gph; equivalent sizes for gas. Form 3356A. *Petro.*

374—Spiral-Wound Gaskets

General catalog, 28 pages, tells about the development of the original spiral-wound gasket and its present applications in aviation, atomic research, process industries, power plants, and ships of the Navy and Merchant Marine. It also lists various metals and fillers used in the manufacture of these gaskets. *Flexitallic Gasket Co.*

375—Mobile Generating Stations

Trailer mounted mobile generating plants, complete rolling power stations, are described in this plastic-bound handbook. For temporary tie-in, or semi-permanent installation diesel or dual fuel operation these mobile plants may be practical. In four sizes 350-, 500-, 1000-, and 1250-kw. *White Diesel Engine Division, The White Motor Company.*

376—Surface Condensers

Twin bank, balanced flow design surface condensers – complete description, design details, exclusive features, and numerous photos of public utility and industrial power plant installations – are presented in 32-page bulletin 8.2K1. Details of single bank, balanced flow design are in bulletin 8.1K1. *Ross Heat Exchanger Div., American-Standard.*

377—Jet Ignition Stokers

Bulletin G-85 describes the B&W jet ignition stoker. Rapid response to load change ignition stability, efficient combustion, and a simple compact hydraulic drive insure economical operation. Jet ignition stokers adapted to boilers in specific industries are shown and a typical fuel chart with comments and ASTM rank. *The Babcock & Wilcox Co.*

378—Rotary Burners

The new Todd Series B rotary fuel oil burners are summarized in four-page bulletin TD56-82X. It includes a burner size selector chart and lists 11 advanced design features of seven basic sizes rated from 400,000 to 22,500,000 Btu per hr, with oil capacity from 3 to 150 gal per hr. *Todd Shipyards Corporation, Products Division.*

379—Pressure Boiler

Bulletin AD 166 describes the new monitor packaged boiler which is designed to supply high pressure steam for food processing plants, laundries, chemical plants, dairies. Rated 15 to 60 hp, 150 psi. Burns oil, gas with equally high efficiency (minimum 80%). Pre-engineered, pretested in factory. *Cleaver-Brooks Company.*

380—Constant Weight Feeders

Bulletin 253, 16 pages, discusses feeding, proportioning, and batching problems in all types of industries. Various applications of the Model WS Feedoweight and its principle of operation are described. Standard specifications, drawings, and capacities of this automatic continuous gravimetric feeder are given. *Merrick Scale Mfg. Co.*

381—Blowers For Liquids Agitation

Spencer bulletin 142-B describes blowers for sewage agitation and a variety of processing requirements. Typical applications are illustrated and general information included on Spencer blowers, available in capacities from 85 to 20,000 cfm and pressures from 4 oz. to 10 lbs. Typical job specifications are also included. *The Spencer Turbine Co.*

382—Hyflow Oil Filter

Bulletin F-154 has detailed description of "C" Series oil filters for high flow rate filtration of internal combustion engine lubricating oil, using by-pass, shunt, or full-flow systems. Also for filtration of various types of indusrial oils, fuel oil, solvents, coolants, used in the manufacturing and chemical process industries. *The Hilliard Corporation.*

383—Heat Transfer Coils

Bulletin 355, a 52-page treatise on Dean Thermo-Panel Coils which "Take The Place Of Pipe Coils." Includes information on construction, specifications, standard types, curved panels, styles of embossings, materials, coatings, pressures, heat transfer, weight, capacity. *Dean Thermo-Panel Coil Div., Dean Products, Inc.*

384—Proportioning Equipment

This twelve-page bulletin includes typical installation diagrams and complete details of multi-liquid proportioning and blending systems for liquid production processing. Simplicity and compactness of the Xacto blending system is explained and illustrated with flow diagrams. Typical wiring diagrams also are given. *Bowser, Inc.*

385—Automatic Conveyor Scales

Bulletin 375 describes the Merrick Model E Weightometer and its uses for automatic continuous in-transit weighing of bulk materials over an existing belt conveyor. Specifications and drawing of typical conveyor arrangements shown. Other types of automatic weighing machines also are described in some detail. *Merrick Scale Mfg. Co.*

386—Oil Reclaimer

Revised bulletin R-160-58 describes Hiko reclaimer that produces and maintains oil free of all solids, sludge, acid, moisture, solvents, dissolved gases. Includes complete description of the process plus line drawings of machine operating and installation suggestions. Complete specifications and selection chart. *The Hilliard Corporation.*

387—Thermo-Panel Coil Data

Prices and data on Dean Thermo-Panel Coils which "Take The Place Of Pipe Coils" for industrial heating and cooling processes. Bulletin 258 shows how to do your own estimating. Zinc metallizing; edge sealing; double and single embossed; heat transfer. Tables aid in solving problems. *Dean Thermo-Panel Coil Division, Dean Products, Inc.*

388—Conical Vacuum Dryer

Bulletin 238 is an informative leaflet describing the Dravo Dyna-Cone dryer. Advantages of double-cone drying over other methods are discussed, and several specific features of the Dyna-Cone, such as insulated jacketing, control and safety devices, and discharge door, are illustrated. The catalog includes specifications. *Dravo Corporation.*

389—Cartridge Filter Separators

This bulletin presents detailed technical data on RECO single-cartridge filter-separators. Specifications, installation diagrams, descriptions, operation data, construction features, cartridge-replacement diagram, and an explanation of the single-cartridge line are included. RECO filter-separators do an efficient job. *Richmond Engineering Co., Inc.*

390—Process Equipment

Bulletin 53 deals with various types of wood tanks and accessories for chemical processing, water storage, water treatment, and waste disposal. Bulletin 18 describes round tanks, frost proof pipe boxing, rectangular tanks, and tanks for sprinkler systems, etc. For economy and satisfactory performance use wood. *Wendnagel and Co., Inc.*

391—Packaged Heater

Bulletin 168 describes a new packaged direct-fired heater designed to heat and circulate transfer oils at temperatures up to 450 F. Heater provides safe high temperature low pressure heating of asphalt, chemicals, oils. Oil, gas, and combustion fired models 1,800,000 to 3,000,000 Btu/hr input. Bulletin valuable to consultants. *Cleaver-Brooks Company.*

392—Platecoil Advantages

Tranter's Platecoil bulletin lists and graphically illustrates the advantages, applications, and construction of the Platecoil units. More than a dozen varied applications are pictured and discussed. Specifications for the four Platecoil styles are listed, including their surface area, size and weight plus a conversion table. *Tranter Mfg. Inc.*

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393—Proportioning Pumps

Catalog No. 604 describes the full line of precision proportioning pumps with capacities from cc's per hour to 730 gph per feed. Pressures up to 30,000 psi. Wide selection of materials of construction gives versatility in application. All pumps that are described in this catalog can be adapted for automatic control. *Hills-McCanna Company.*

394—Double Suction Pumps

De Laval single stage double suction Types T, U, and W centrifugal pumps for handling large volumes of water are described in six-page folder 1005. Advantages of each construction feature are detailed and a cutaway drawing given. Double volute pumps for heads of 250 feet and higher are described briefly. *De Laval Steam Turbine Co.*

395—Submersible Booster Pumps

Verti-Line submersible booster pumps and motors (designed by Layne & Bowler and General Electric) are described in four-page folder 400. It gives specifications, selection tables, and application data. Sketches show pumps in typical installations for cooling tower service, sump operation, and fire protection. *Layne & Bowler Pump Co.*

396—Rotary Positive Gas Pumps

Bulletin 31-B-17 deals with rotary positive displacement gas pumps, 7-in. gear diameter and smaller, and accessory equipment. Selection tables, dimensions, performance data, and illustrations for 18 standard sizes are given for 0.5 sp gr gas, capacities 5 to 900 cfm at pressures 1 to 6 psig. *Roots-Connersville Blower.*

397—Centrifugal Pumps

Bulletin 350 will help to select Types HLM-HIM horizontal split-case, single-stage, double-suction pumps for chilled water, booster service, etc. Performance, specifications, dimensions on 17 sizes. Large sectional view shows choice of bearings. Capacities range from 85 to 4500 gpm at heads up to 175 feet. *American-Marsh Pumps, Inc.*

398—General Service Pumps

Bulletin 110 details general service Unipump AC line. Complete selection table and performance curves at 3450 and 1750 rpm are given. Mechanical illustration details outstanding construction features together with complete dimension charts for all sizes. Horsepower ratings from ¼ to 7½. *The Weinman Pump Manufacturing Co.*

399—Axial Compressors

This new 12-page bulletin, 16B8863, describes the company's broad range of axial compressors for industrial, petrochemical, and aeronautical applications. The bulletin contains installation photos of these units serving various industries. An engineering section discusses design theory. *Industrial Equipment Div., Allis-Chalmers Mfg. Co.*

400—Gearex Rotary Pumps

Eight-page bulletin G-2 gives construction, dimensions, capacities, and applications of Gearex rotary pumps: internal bearing type for lubricating materials; external bearing type for non-lubricating. Capacities are 1 to 550 gpm; pressures 250 psi for viscous liquids, 50 psi for water; viscosities 32 to 500,000 SSU. *Sier-Bath Gear & Pump Co., Inc.*

401—Centrifugal Pumps

Bulletin 721.6 gives full information, specifications, performance curves, and dimensions of 19 sizes of Goulds double-suction centrifugal pumps. Capacities to 6400 gpm, heads to 400 ft., sizes 3 in. to 12 in. Built in three groups to provide maximum interchangeability of parts. Also available in wide selection of materials. *Goulds Pumps, Inc.*

402—Pumping Problems

"How to Solve Pumping Problems," 36-page instruction manual, covers important fundamentals of estimating requirements of the average pumping job. It contains sample problems on hydraulic systems, general transfer, and pressure transfer, plus tables, charts, and other pertinent engineering and design data. *Roper Hydraulics, Inc.*

403—Rotary Pumps

Bulletin 409 is an 8-page folder illustrating the applications of Viking rotary pumps for handling petroleum products in the producing, refining, and marketing fields. It covers also LP-gas applications, pumping of chemicals, diesel fueling, handling liquid and semi-solid foods, road-building applications, and custom-built pumps. *Viking Pump Co.*

404—Double Suction Pumps

Bulletin 955S gives complete data on Buffalo double-suction single-stage centrifugal pumps. Information includes capacities, approximate dimensions, and construction details. Recommended for almost any service where clear water is to be handled. Special section on Buffalo Underwriter fire pumps. *Buffalo Pumps Division, Buffalo Forge Company.*

405—Duplex Piston Pumps

Bulletin 230 revised describes "Realwear" horizontal duplex piston pumps for a variety of applications including boiler feed and fuel oil services. The bulletin has sectional views, selection and dimension table, and details of outstanding features including Durabla valves, cup-packed pump pistons, piston valve chest. *Warren Pumps, Inc.*

406—Vertical Turbine Pumps

Bulletin B-505 illustrates and describes features of vertical close-coupled turbine pumps. Space-saving, compact, efficient, these pumps solve difficult pumping problems. Versatile, easily installed and maintained, these pumps are ideal from an operational standpoint. Bulletin discusses sump design. *Peerless Pump Div., Food Machinery & Chemical Corp.*

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407—Glassed Centrifugal Pumps

Goulds bulletin 5211 is a "Facts" booklet on the construction and application of Goulds-Pfaudler glassed pumps for pumping corrosives. Forty questions most frequently asked about this revolutionary new pump are answered in detail. Recommended reading for anyone concerned with pumping acids or alkalis. *Goulds Pumps, Inc.*

408—Multistage Pumps

Bulletin 980 gives complete information on Buffalo Class "RR" single suction multistage pumps, including details and instructions for installation and operation. These pumps are available in two- and four-stage models for clear water high-pressure, high-temperature service. Capacities are to 900 gpm. *Buffalo Pumps Division, Buffalo Forge Company.*

409—Centrifugal Pumps

Boiler feed and general service type HHM centrifugal pumps are described in bulletin 381. Of two-stage single-suction design, these pumps feature horizontally split-case construction and ball bearings. Performance, specifications, dimensions, and construction cutaway shown. Heads to 930 feet, to 800 gpm. *American-Marsh Pumps, Inc.*

410—Compressors and Vacuum Pumps

Bulletin C-6 describes Fuller rotary compressors and vacuum pumps, gives cutaway drawings, and illustrates uses by pictures of typical in-plant installations. For compressing air and gases, these efficient units have capacities to 3300 cfm; pressures to 125 psig; vacuums to 22.95 in. (with reference to 30 in. barometer). *Fuller Company.*

411—Industrial Pumps

Easy to use table for determining horsepower, capacity, and head for close-coupled vertical pumps makes bulletin 1100 of real value. It also contains sectional views, material specifications, schematic application drawings, and photos of installations. Verti-Line pump features are clearly illustrated and described. *Layne & Bowler Pump Co.*

412—General-Purpose Pumps

Folder 58S illustrates general-purpose pumps in sizes from 2/3 to 1050 gpm for pressures to 50 psi on non-lubricating liquids, 100 psi on lubricating liquids; heavy-duty pumps in sizes of 10 to 300 gpm suitable for pressures of 100 psi on non-lubricating liquids, 200 psi on lubricating liquids. Data includes specially built pumps. *Viking Pump Co.*

413—Double Suction Pumps

Bulletin 225 revised describes nine sizes of Warren type DB horizontal split-case, single-stage double suction pumps for general water service for capacities up to 1200 gpm and heads up to 170 feet. The bulletin also includes detailed specifications, sectional views, selection table, and outline dimensions of these pumps. *Warren Pumps, Inc.*

414—Centrifugal Compressors

Centrifugal compressors series RS bulletin provides descriptions and specifications of multistage centrifugal compressors of capacities from 1,000 to 100,000 cfm on air and gas service for refineries, chemical plants, industrial air users. Compressors with two or more inlets are used in hydrocarbon refrigeration service. *Cooper-Bessemer.*

415—Proportioning Pumps

Bulletin 302 features the new integral McCannameter and describes design details. This proportioning pump affords space savings of up to 2/3 over previous designs. Available with either diaphragm or bellows construction, with maximum capacities from 6 cc per minute to 6 gph. Maximum discharge pressure is 2500 psi. *Hills-McCanna Co.*

416—Corrosion Resisting Pumps

Bulletin P/30 gives complete information concerning corrosion resisting Series H Durcopumps. Included are construction features, detailed Durcopump performance curves, dimension drawings, and engineering data. Series H Durcopumps are available in 4 standard alloys, plus many special alloys, from 1 in. x 1 in. to 10 in. x 8 in. *The Duriron Co., Inc.*

417—Multipurpose Pumps

Bulletin 1000 describes SB multi-purpose split-case double-suction centrifugal pumps. Sectional view illustrates mechanical construction features. Performance curves at 1150, 1750, and 3450 rpm are given. Complete selection table to 180 gpm and heads to 220 feet, plus accurate dimensions for all sizes. *The Weinman Pump Manufacturing Co.*

418—Double Suction Pumps

Performance data, dimensions, and specifications on the De Laval single-stage double-suction Types L, M, and P centrifugal pumps, with capacities of 1000 to 20,000 gpm and heads to 350 ft., are presented in six-page bulletin 1004. Features, construction, dimensions, and advantages are described. *De Laval Steam Turbine Co.*

419—Horizontal Multistage Pumps

Bulletin B-1400 describes complete line of horizontal split-case multistage pumps for water booster service, other low temperature water applications. Ideal where medium to high capacity and medium pressures are required. Efficient design means economical in first cost and long life. *Peerless Pump Div., Food Machinery & Chemical Corp.*

420—Hydraulic Pumps

Roper bulletin 31 shows the features and general operating characteristics of these compact hydraulic pump and motor units. Sizes range from .6 to 6.8 gpm for pressures to 400 psi. Integral motor drives are single phase, single or dual voltage. In open drip-proof or totally enclosed construction. For hydraulic, pressure feed, transfer work. *Roper Hydraulics, Inc.*

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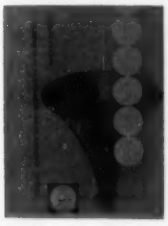
SOUND SYSTEMS

421—School Sound Systems

Eight-page brochure 7135-D-55 illustrates and describes a complete line of Underwriters' listed school sound distribution systems. It covers equipment suitable for the smallest to the largest school units. Building-block flexibility of console styles, panels, and functions is pointed out. High power intercoms are covered. *DuKane Corp.*



422—Custom Sound Systems

Amply illustrated 8-page brochure describes sound amplification systems custom-engineered for stadia, auditoriums, field houses, coliseums, and similar structures. Several such custom installations are described, including Milwaukee County Stadium, Hollywood Bowl, Cotton Bowl, Alabama State Coliseum. Form 3R-2858. *Radio Corporation of America.*

423—Audible Signal Guide

New 20-page booklet describes use, application, and types of audible signal equipment for modern industry. Contains signal terms and definitions plus a complete selection chart of sirens, howlers, and buzzers. This booklet enables you to lay out and make recommendations for the major industrial signal applications. *Benjamin Electric Manufacturing Co.*

424—Economy School System

Eight-page catalog illustrates and describes a flexible, economical school system, combining sound, intercom, and time tone signals. This system can, at any time, be easily expanded to provide console or rack panel equipment, interior fire, and emergency alarms without sacrificing original wiring, conduit, or classroom stations. *Executone.*

425—Paging Systems

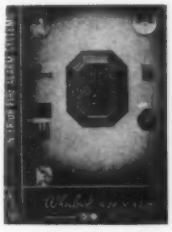
Catalog 4B describes an audible signaling system for locating key personnel anywhere within a plant, department store, institution. Transmitting unit is located at the switchboard or other central location and features simple, positive push-button operation. The desired code is sounded on bells, chimes, or horns. *Wheelock Signals, Inc.*

426—Dial-X Telephone System

Folder S-100R-2 shows how to banish seven common telephone annoyances with a Dial-X private telephone communication system. Switchboard equipment and four styles of telephones are illustrated and described for ten to seventy-four line systems. Dial-X system is unmatched for flexibility. *Stromberg-Carlson, Special Products Division.*

427—Hospital Systems

Twelve-page color booklet illustrates and describes a large variety of individual hospital communication and sound systems, including audio-visual nurse call, doctor's paging, bedside radio-sound, and administrative intercom. Equipment, operating features, local planning, and service facilities available are discussed in detail. *Executone.*



428—Fire Alarm Systems

Catalog 3A describes four basic system types available to meet the simplest or most complex signaling requirements. Features custom-built control panels, variety of coded and non-coded stations, single-stroke bells, chimes and special tone signals, and full supervision of panel wiring and station and signal loops. *Wheelock Signals, Inc.*

429—Communications Systems

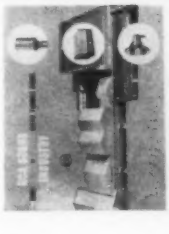
Catalog S-104R illustrates and describes 17 models from single channel to three channel systems. Both table top turrets and consoles with capacities from 22 to 180 rooms. Provisions included for telephone intercom, loudspeaker intercom, high fidelity FM-AM radio tuner, 3-speed transcription player. *Stromberg-Carlson, Special Products Division.*

430—Industrial Sound Systems

Four-page bulletin 12k/Du illustrates and describes sound, alarm, and evacuation systems in use in some of the largest companies in the country. It outlines operation and functions of various types of systems designed to meet specific requirements, and emphasizes use of standard panels for custom systems. *DuKane Corp.*

431—Signaling System

Standard Electric Time's 8-page catalog No. 221 describes their Royalmatic Nurse Saver hospital signaling systems. Included are photos and descriptions of the components with list numbers. A description of the over-all workings of the system is given, with suggestions as to how and where they might be utilized. *Standard Electric Time Co.*



432—Industrial Sound Systems

This 12-page brochure describes and illustrates functions, advantages, and applications of sound in various plant locations. Central control consoles and other typical sound equipment units are shown and briefly described. RCA sound provides instant communication with anyone – anywhere – anytime. Form 3R-2478. *Radio Corporation Of America.*

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STRUCTURAL MATERIALS AND EQUIPMENT

433—Protective Coatings

Bulletin 7-2 describes the advantages gained by use of Atlas protective coatings – barriers between your client's plant and corrosion. Atlas coatings protect walls, beams, exhaust systems, and equipment exteriors from corrosive fumes and splash. Also included are details concerning surface preparation. *Atlas Mineral Products Company.*

434—Safety Grating

Safety Grip-Strut, an anti-skid grating in which the vertical members are joined by integral saddle to create lateral struts of great strength, is described in 12-page booklet. General applications, installation and assembly, and fastening devices are discussed. Load tables are given for both steel and aluminum grating in this booklet. *The Globe Co.*

435—Rolled Steel Floor Plate

New eight-page booklet 3312 on A. W. Algrip abrasive rolled steel floor plate contains an allowable uniform load table and table of maximum sizes for plates from ⅛ to ½ inch in thickness and complete engineering and fabricating data. Many safety applications for A. W. Algrip floor plate are pointed out. *Alan Wood Steel Co.*

436—Concrete Fasteners Guide

Catalog 57 features the complete line of Red Head concrete fasteners. Contains specifications for snap-off end, rod hanger, tie-wire, stud-anchor, flush end, and clinch nail fasteners (¼- to ⅞-in. bolt size). Diagrams illustrate impact hammer and hand installation. Accessories and electric impact hammer also are shown. *Phillips Drill Co.*

437—Interior Wall Finish

Swift's Adcote adhesive finish, a new concept in interior wall finish for board type insulation, refinishing concrete surfaces, resurfacing brick walls, dry wall construction, and applying ceramic tile is described in folder 9383. Principally for cooler and freezer walls, the finish retains its whiteness. *Swift & Co., Adhesive Products Dept.*

438—Grating and Treads

Gary grating and treads tailor-made to suit your individual requirements are illustrated in a 24-page brochure. Two-page spread includes tables of safe loads, specifications, and other engineering data. Photographs in this booklet also show many typical applications of the decking. *Gary Grating Div., Rockwell Spring and Axle Co.*

439—Steel Stair Treads

Tread-Grip steel stair treads combine strength of construction with safe, nonslip footing, according to four-page booklet HTP2130. It describes such features as A. W. Algrip nosing, electroforged and welded construction, and twisted cross bars. Detail drawings and dimensions. *Speedline Stainless Steel Fittings Div., Horace T. Potts Co.*

440—Translucent Panels

Brochure "What to look for in a good translucent building panel" gives complete coverage of all characteristics in a translucent structural panel. Also explains in detail exactly what to look for when purchasing or specifying these panels. 4-page colored brochure. Completely illustrated. *L-O-F Glass Fibers Co., Corrulux Div.*

441—Aluminum Grating

This new four-page folder features unusual uses for floor grating, including its use as sun shades for modern schools, and as low maintenance pressure-locked fencing that never needs painting. It shows dimensional diagrams of standard designs and gives safe load table for aluminum grating. *Borden Metal Products Co.*

442—Wood and Steel Doors

New, 1958 bulletin 92 demonstrates how both wood and steel RoL-TOP doors, with their straight-line outward appearance, are well suited to modern building needs. Drawings show recommended types for various applications and clearances, types of operation, special features, and dimensions. *The Kinnear Mfg. Co.*

443—Concrete Wall Panels

Insulated precast concrete wall panels and rigid steel framing combined in custom "Panel Bilt" buildings are shown in four-page pamphlet 7285. Panel and structural details are shown for each industrial and commercial purpose described. How this type of construction saves time and money is explained. *The Marietta Concrete Corp.*

444—Steel Design Manual

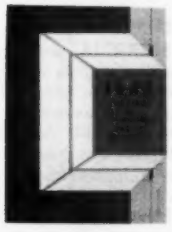
The first complete text on how to design high-strength low-alloy steels. Concise, well-written. Covers unit stresses, beams and columns, plates, riveting, and designing to thwart corrosion. Probably the only basic text extending design fundamentals to the higher strength levels of high-strength steels. *United States Steel Corp.*

445—Electrified Sub-Floors

Mahon electrified Cel-Beam floor systems designed to safeguard buildings against electrical obsolescence are detailed in this new 16-page bulletin M-58. Use with concrete topping and floor covering, fire resistance ratings, engineering data, dimensions and specifications, and load and property tables are given. *The R. C. Mahon Co.*

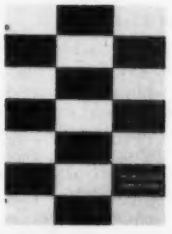
446—Steel Joists

This 40-page steel joist catalog contains complete design information for spans up to 120 ft. It covers in detail design calculations, bridging, end details, and accessories. Complete tables of properties and dimensions, standard loading, and design load, and marking system for ordering are given. *American Bridge Div., United States Steel Corp.*



447—Joint Sealer

Four-page bulletin IS-56 describes the properties of Igas joint sealer, its use in water reservoirs, swimming pools, tunnels, and deep basements, and its suitability for all structural materials. A new sheet describing the use of Igas gun grade for membrane waterproofing is also included in this bulletin. *Sika Chemical Corporation.*



448—Floor and Roof Panels

Catalog BP-20 presents Fenestra's family of light gage steel structural systems for floors and roofs. Included are engineering data, installation details and specifications for the "D" panel systems, TAC systems, Holorib and Econorib decks, and Type "E" deck. An outline of building requirements with applications of each system included. *Fenestra, Inc.*

449—Pre-Engineered Buildings

General catalog 1375 covers the general line of Butler metal buildings including both standard roof pitch and the new low-profile 1 to 12 roof pitch. Describes the pre-engineered rigid frame structures and the construction features and accessories as used in the Butler building system for both commerce and industry. *Butler Manufacturing Co.*

450—Hollow Metal Doors

Milcor hollow metal doors for commercial, industrial, and institutional buildings are described in catalog 280. Styles and types of doors, frames, hardware, and accessories are included with suggested specifications. Milcor hollow metal doors are designed for both heavy industrial and light commercial use. *Inland Steel Products Company.*

451—Asbestone Panel

Bulletin 2786 shows uses and detailed application drawings for this laminated asbestos and fiberboard roofing and siding product. Asbestone panels can be used for exterior walls or roofs, as well as office partitions inside. Asbestone panels provide fast application, fire-resistance, and insulation. A.I.A. File No. 19-D. *National Gypsum Company.*

452—Rigid Frame Buildings

New 20-page booklet describes Stran-Steel Corporation's complete line of rigid frame buildings with the luxury look of Stran Satin for industrial and commercial use. Building features, construction details and dimensions are clearly shown. For manufacturing and processing plants warehousing, retail operations, rugged service use. *Stran-Steel Corporation.*

453—Prestressed Concrete

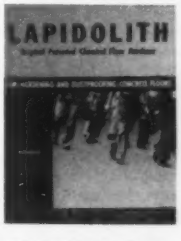
Construction stories of 16 outstanding prestressed projects in this country and abroad, featured in new 20-page book, illustrate the almost unlimited application of prestressed concrete. Photographs and job stories cite role played by Pozzolith in achieving the high quality concrete required for prestressed work. *The Master Builders Company.*

454—Corobond Resin Cement

Corobond is an improved synthetic resinous bonding cement for brick and tile. Unlike ordinary resin cements, Corobond offers superior workability, faster final cure, greater economy, plus improved chemical and thermal resistance. Corobond hardens to an extremely dense material that provides high mechanical strength. *The Ceilcote Company, Inc.*

455—Concrete Filled Columns

This catalog lists different types of columns together with properties and safe load tables for concrete filled standard weight and extra strong pipe columns. Included are properties and safe load tables for square and rectangular columns. Types of columns and connections are shown along with standards for caps and bases. *Tubular Products, Inc.*



456—Concrete Floor Hardener

Lapidolith, original patented formula for chemically hardening and dustproofing concrete floors, is described in a new 4-page brochure. It shows photographs of actual installations in a variety of industries, specifications, application data, and information on Sonneborn's 3-year minimum bonded guarantee. *Building Division, L. Sonneborn Sons, Inc.*

457—Penstock Construction

Twenty-two page technical paper tells how Prepakt concrete was used to backfill an 11-foot diameter underground penstock tunnel, under a 2600-ft static head, at Kemano, B. C. Describes construction sequence, aggregate platement, grout batching and pumping, core drilling, and test results. Includes drawings, graphs, tables. *Intrusion-Prepakt, Inc.*

458—Steel Windows and Doors

Catalog S-58 describes the complete Bayley line of steel windows and doors, including original Bayley features such as the interlocked muntin joint, "variable-width-adjustable" mullions. The booklet details such items as heavy intermediate projected windows, horizontally pivoted windows, intermediate classroom windows. *The William Bayley Company.*

459—Flexible Structural Struts

Bulletin 229 describes methods for using ball-and-socket type flexible joints on guy wires, braces, or struts used to position stacks, vessels, piping, or tall columns subject to wind sway, vibration, or thermal movement. Flexible bracing maintains axial alignment while allowing free lateral movement. *Barco Manufacturing Co.*

460—Estimating Guide

Sonneborn outlines uses and costs for 37 different "Building Saver" products. It covers treatments for concrete and wood floors, as well as admixtures for concrete and mortar, and waterproofing and dampproofing compounds. There is quick-reading information on use, method of application. *Building Products Division, L. Sonneborn Sons, Inc.*

461—Concrete Tensioning Materials

Catalog PC-936 shows sizes, weights, strengths, and typical load-elongation curve of uncoated stress-relieved strand for pretensioned bonded prestressed concrete. Properties of galvanized strand and uncoated stress-relieved wire for post-tensioned design are listed. End fittings, bearing plates are illustrated. *John A. Roebling's Sons Corporation.*

462—Insulated Metal Walls

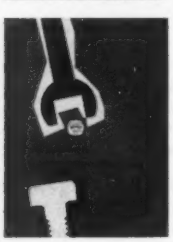
Insulated metal walls and wall panels of various types, and Underwriters' rated fire walls, with over-all "U" factor superior to that of a conventional masonry wall with furred lath and plaster, are described in 16-page bulletin W-58. Materials, construction, thermal properties are given, with construction details. *The R. C. Mahon Co.*

463—Weldirectory

Weldirectory of manual electrodes for mild steel and low-alloy high-tensile steels. Bulletin 7000.1 tells how to select the proper arc-welding electrode for each application. Describes Lincoln mild steel and low-alloy electrodes on basis of properties, operating characteristics, and applications. Gives welding procedures. *The Lincoln Electric Co.*

464—Corrugated Roofing, Siding

New manual 2032 depicts and explains all accepted methods of applying corrugated Asbestone "400". Gives instructions on storage, handling, accessories, sealing compounds, plus detail drawings. Gold Bond corrugated Asbestone "400" resists rot, fire, salt air, corrosion. Also has many interior uses. A.I.A. File No. 12-F. *National Gypsum Company.*



465—Construction Service

Manual CS-5256 describes the Armco construction service, its scope of work, qualifications, experience, equipment, and methods of installing Armco products. Some of the many services rendered are tunneling with liner plate, jacking, boring, threading, and open-trench installation of drainage structures. *Armco Drainage & Metal Products, Inc.*

466—Corrugated Wire Glass

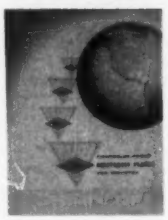
Thirty-six pages of information on corrugated wire glass sash and skylights, with particular emphasis on technical details. Drawings show all types of conditions normally encountered in sash and skylight installation. A special section is devoted to sash operating devices, with drawings and specifications. Form No. S-5-58. *H. H. Robertson Co.*

467—Pre-Engineered Buildings

Twelve-page catalog 1468 discusses and demonstrates the versatility of Butler metal and systems buildings as they are used as industrial buildings. Highlights rigid frame steel construction, wide span interiors, economy and quality of finished structure, construction features, advantages in planning and layout. *Butler Manufacturing Co.*

468—Lightweight Aggregate Concrete

A new publication, MBR-P-14, presents histories of 13 outstanding projects where lightweight aggregate concrete provided decided advantages and economies. Job stories illustrate how Pozzolith helped achieve high quality lightweight concrete. Discussion covers use of lightweight aggregate concrete as a structural material. *The Master Builders Company.*

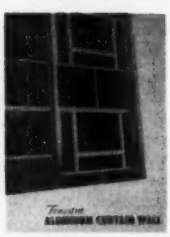


469—Corrosion-Proof Systems

Duracor reinforced plastic resists practically any acid, fume, gas. Strong lightweight units require minimum support, offer integral resistance to heat or flame. Hoods, ducts, elbows, and the like supplied from stock or fabricated to individual specifications. Applications include plating, pickling, chemical tank construction. *The Ceilcote Company, Inc.*

470—Steel Roof Deck

Milcor steel roof deck, Bonderized and painted with a baked enamel primer, is described in catalog 240. It contains data on Bonderizing and painting operations; types of deck available, including new long-span Celludeck; safe load and section property tables, accessories, and suggested specifications. *Inland Steel Products Company.*



471—Aluminum Curtain Walls

Aluminum curtain wall catalog CW-10 presents the complete family of aluminum curtain wall systems which Fenestra produces. Included in the information are specifications, installation details, window and panel details, and building applications. Included is the Shad-O-Wall series, a low-cost, sturdy curtain wall system. *Fenestra, Inc.*

472—Flooring, Grating, Treads

This 20-page bulletin describes the wide line of Hendrick's Mitco open steel flooring, aluminum grating, Shur-Site treads, Armogrids, and driveway grating. Fully illustrated with photos of actual installations in a wide range and variety of industries. Complete with sizes, specifications, capacities, and applications. *Hendrick Manufacturing Co.*

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473—Grating

This 16-page catalog shows the three basic types of grating construction; gives more than 30 dimensional drawings of subtypes; eight safe load tables covering steel and aluminum grating, roadway grating, and sidewalk slabs; tables on panel widths, tread widths, and floor armor. Planning layouts are given. *Borden Metal Products Co.*

474—Concrete Fasteners

"Reddi-Reference" chart pictures Red Head concrete fasteners in full size. All types: flush end, snap-off end, stud anchor, rod hanger, tie wire, and clinch nail. Also shows Red Head chucks and gives instructions for installing fasteners by hand or impact hammer. Chuck ordering information on back cover. *Phillips Drill Co.*

475—Curtain Walls

Catalog describes the Lupton curtain wall systems developed in cooperation with leading architects. Incorporating Lupton's 50 years of experience in the manufacture of metal windows, Lupton curtain walls have been tested and approved by actual use. Includes construction details, specifications, and dimensions. *Michael Flynn Mfg. Co.*

476—Building Products

Aluminum Co. of America now offers "Alcoa Aluminum Industrial Building Products," a 36-page booklet describing in detail the characteristics, dimensions, availability and specifications for Alcoa aluminum roofing and siding designed specifically for application in industrial buildings. Booklet is fully illustrated. *Aluminum Co. of America.*

477—Rolling Doors

Bulletin 96, 24-pages, is a complete catalog of the many types of doors made by Kinnear. It gives information on the types of operation, both manual and electrical; elevation drawings; mounting methods for various applications and locations; specifications; and explains special construction features of these doors. *The Kinnear Mfg. Co.*

478—Industrial and Hangar Doors

16-page catalog covers the various types of doors manufactured and installed for industrial building and aircraft hangar installations. Included are canopy type, motorized slide, turn-over, and vertical lift doors. Doors such as for crane entrances and the "Byrna-perature" for hangars are also described and illustrated. *Byrne Doors, Inc.*

479—Structural Maintenance

January, 1958 "Prepakt Reporter" presents details on use of the Prepakt technique for maintenance and repair of deteriorated concrete structures of all types. Maintenance construction, plant alterations and additions, underwater construction, grouting applications and closure are discussed in an educational technical paper. *Intrusion-Prepakt, Inc.*

480—Grating Flooring and Treads

General grating catalog F-400 contains illustrations, descriptions, and complete engineering data on grating flooring, treads, and floor armoring (riveted, press-locked, and welded types). Irving grating is safe, durable, fireproof, ventilating, clean, and economical for industrial and power plants and stairways. *Irving Subway Grating Co., Inc.*

481—Welded Grating

This eight-page bulletin shows details of new lightweight, extra strong Gold Nugget welded grating suitable for power houses, loading docks, oil refineries, fire escapes, drain grates, and all types of heavy duty platforms. General engineering data, safe loading tables, and directions for specifying welded grating are given. *The Globe Co.*

482—Tubular Concrete

Filled columns bulletin 1110 contains description of the application and advantages in specifying tubular columns for any type of construction. Bulletin includes safe load tables and construction details of tubular columns plus general information on Tubular's complete line of steel column products. *Tubular Products, Inc.*

483—All-Steel Buildings

New 'erect-it-yourself' all-steel buildings, called the Stran-Master, are described in illustrated catalog. Ideal for low-cost warehousing, light manufacturing, retail stores, general utility, the Stran-Master can be erected by an unskilled crew in 180-200 man-hours. Adjustable telescoping columns and girts. *Stran-Steel Corp.*

484—Curtain Wall Systems

Catalog C-58 briefly outlines Bayley aluminum or steel curtain wall systems and insulated panels with Bayley aluminum projected windows. Outstanding advantages of Bayley curtain walls include choice of distinctive wall treatment without cost of special design, a wall engineered to accommodate a building's movement. *The William Bayley Company.*

485—Translucent Structural Panels

Bulletin SW-2 gives complete selection data, physical and chemical properties, general recommendation and installation details as well as accessory data for Corrulux translucent structural panels. Gives specifications in table form. Installation details and typical detail drawings also are included. *L-O-F Glass Fibers Co., Corrulux Div.*

486—USS "T-1" Alloy Steel

The most comprehensive collection of facts and data about USS "T-1" constructional alloy steel. Complete data on available sizes, forms, conditions, fabrication, welding, and application of this product which is three times stronger than structural steel. Properties and characteristics are included in the 64-page booklet. *United States Steel Corp.*

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487—Arc Welding Equipment

New bulletin 5200.1 describes fully automatic submerged arc welding equipment for shop and field applications. Includes discussion of submerged arc process, applications, and supplies. Helps prospective user determine for his own job the suitability of the process, the preferred type of equipment. *The Lincoln Electric Company.*

488—Corrosion-Proof Linings

New Atlas bulletin 4-2 describes corrosion-proof linings for both concrete tanks and steel vessels. A cross-section of a typical installed tank lining and a complete resistance chart are included in this bulletin. This bulletin should be of wide use to consulting engineers throughout the country. *Atlas Mineral Products Company.*

489—"Tri-Ten" Alloy Steel

"Tri-Ten, High-Strength Alloy" is title of 24-page catalog by United States Steel. Catalog gives properties and characteristics including weldability, workability, corrosion resistance, mechanical property requirements, chemical composition, and comparative engineering data. Also includes fabricating data. *United States Steel Corp.*

490—Hot Weather Concreting

This 8-page bulletin PCD-57 describes the effect of Plastiment on the cement gel formation to produce increased strength, bond to steel, and reduced cracking. Also included in the bulletin are separate sheets outlining the particular advantages of using Plastiment for projects involving hot weather concreting. *Sika Chemical Corporation.*

WATER TREATMENT AND WASTE DISPOSAL

491—Reactivators

Basic design and operation principles of the Graver Reactivator are explained in 12-page bulletin WC-103A. Typical flow diagrams show installations at a petroleum refinery, municipal water supply plant, feedwater at a boiler plant, and a paper mill (recovering paper stock and water from white water). *Graver Water Conditioning Company.*

492—Research Facilities

Bulletin 100, eight pages, pictures Nalco research facilities. Brief descriptions of the areas in which the company conducts research are given with information on the type of specialized studies the Nalco staff is prepared to undertake for the consulting engineer working on industrial projects of various kinds. *National Aluminate Corp.*

493—Automatic Water Softeners

Bulletin 612A describes the Elgin Ultramatic water softener. A completely automatic pilot control panel actuates the diaphragm-type hydraulic valves required to regulate duration and flow rate of each operation – backwashing, brining, rinsing, and return to service. Readily adjusted for any ion exchange system. *Elgin Softener Corp.*

494—Swim Pool Vacuum Cleaner

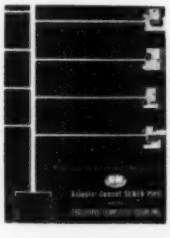
Bulletin 257 describes and pictures the Hopkins swimming pool vacuum cleaner, designed and offered by the makers of the famous "Filtermaster" swimming-pool filters. The many special features of this equipment – providing easier, quicker pool maintenance and long service – are set forth in brief. *Hopkins Equipment Co.*

495—Automatic Water Filter

Bulletin 909 is a ten-page booklet with cutaway drawings to show operation of Adams' automatic water filter. Dimension charts and flow curves are given for the three sizes. Applications include process and make-up water and recirculation, waste, and coolant water. Installation photos are included in the booklet. *R. P. Adams Co., Inc.*

496—Manual Type Water Softeners

Bulletin 200A deals with manual type softeners with single lever multiport valve control. Complete specifications are listed for 18 stock models, with installation diagrams, descriptions, and operation data included. Capacities are to 1.5 million grains single unit, 3 million grains twin unit; flow rates to 175 gpm. *Bruner Corporation.*



497—Fluid-Tite Coupling

Detailed drawings, depicting the function of the Fluid-Tite gasket in Keasbey & Mattison Company's sewer pipe coupling, are featured in a new, 4-page brochure. In addition to the diagrams, illustrating the Fluid-Tite coupling's resistance to infiltration, the pamphlet also describes rigid tests. *Keasbey & Mattison Company.*

498—IonXchange Resins

Bulletin NR describes nuclear grade and technical grade IonXchange resins. Specifications are given for various fully regenerated resins now available for research and process applications. For engineers concerned with design of nuclear reactors and with chemical processes utilizing ion exchange. *Illinois Water Treatment Co.*

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499—Zeolite Water Softeners

New bulletin 4520-D deals with chemical reactions in the zeolite water softening process. This descriptive bulletin includes data on cutaway drawings, and a section on Cochrane Hydromatic single control valves for simplified control of the backwash, brining and displacement, rinse, and back-to-service parts of the cycle. *Cochrane Corporation.*

500—Anodes

Bulletin DA/1c describes Duriron and Durichlor Impressed Current Anodes for fresh water, ground bed, salt water, and duct applications. Duriron and Durichlor are high-silicon cast iron alloys which possess almost complete resistance to the corrosive media encountered in industry. Complete design features furnished. *Duriron Company, Inc.*

501—De-Ionizers

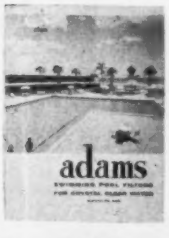
Highly purified water can be obtained "on tap" with these units. They are actually small ion-exchange columns, arranged to be placed wherever convenient. All ionizable solids are removed from the water, including silica and CO_2. Capacities range from 5 to 30 gph, 450 to 1500 grains as $CaCo_3$. *Illinois Water Treatment Co.*

502—Water Supply

Twenty-four page booklet entitled "Supplying Water" describes the unique Ranney methods of supplying more clear water to industry and municipalities. Valuable information is included on horizontal collectors, infiltration galleries. Vertube wells, Ranney intakes, and new dewatering process. *Ranney Method Water Supplies, Inc.*

503—Water Treatment

A popular consultant's guide to correct water treatment, Elgin bulletin 551 deals with prevention of scale and corrosion in boilers, heaters, cooling systems, and other equipment. The brochure covers supplementary treatment for softened, dealkalized, or deionized water and inhibitant treatments. *Elgin Softener Corp.*



504—Pool Filters

New 24-page technical bulletin for architects and consulting engineers on swimming pool filters for municipal, public, and institutional pools. Contains typical installations, cross-section and operational drawings, charts, and factual comparison. This manufacturer does not offer a filter for backyard type pools. *R. P. Adams Company, Inc.*

505—Water Demineralizers

Bulletin WC-111, a completely revised and enlarged edition, deals with the complete subject of demineralization of water. The bulletin is complete with charts indicating the types of units and the advantages and applications of each. Cost-estimating curves and details of equipment are included. *Graver Water Conditioning Company.*

506—Swimming Pool Filters

Bulletin 356 gives valuable information to swimming pool owners and operators on the noted Hopkins line of "Filtermaster" stationary and portable units, explaining how clean, clear water at high flow rates is obtained for large and small pools with these filters, using the efficient diatomaceous-earth filtration principle. *Hopkins Equipment Co.*

507—Asbestos-Cement Sewer Pipe

A recent Keasbey & Mattison brochure entitled "For Modern, Long-life Non-pressure Sewer Systems" illustrates and describes the benefits of using their asbestos-cement pipe and exclusive Fluid-Tite coupling. Included in this 16-page brochure are data on pipe connections, pipe specifications, test results. *Keasbey & Mattison Company.*

508—Hospital Water Stills

Catalog "H" describes Barnstead's complete line of water stills specially designed for hospital use. In capacities of from ½ gallon to 1000 gallons per hour and operated by steam, electricity, gas, and kerosene. Other models for double and triple distillation are also described in this useful catalog. *Barnstead Still & Sterilizer Co.*

509—Ion Exchangers

60-page manual Z-5 explains ion exchange water conditioning processes, the resins and equipment used, quality of water produced, and typical costs involved. Designed as a practical handbook to aid engineers in proper selection and operation of ion exchange units in water conditioning applications. Illustrated. *National Aluminate Corp.*

510—Wood Storage Tanks

Bulletin 53 deals with various types of wood tanks and accessories for chemical processing, water storage, water treatment, and waste disposal. Bulletin 18 describes round tanks, frost proof pipe boxing, rectangular tanks, and tanks for sprinkler systems, etc. For economy and satisfactory performance use wood. *Wendnagel and Co., Inc.*

511—Automatic Water Softeners

Bulletin 400A describes automatic water softeners for heavy duty service. Complete specifications are listed for 17 stock models, with installation diagrams and operation information included. Stock models in capacities up to 1.5 million grains, single unit; 3 million grains, twin unit. Flow rates are up to 175 gpm. *Bruner Corporation.*

512—Contraflo Clarifiers

Bulletin 5811 describes the five basic contraflo designs used for treatment of well and surface waters, and for neutralization, recovery, and separation of waste products. Pictures, drawings, and tables show standard units up to 70 feet in diameter. Specifications and data for larger units are available. *General Filter Company.*

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